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EXPERIMENT STATION RECORD

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The view expressed in these columns last month that research was less a dominating feature of the 1926 convention of the Association of Land-Grant Colleges and Universities than had been the case in the preceding year should not be so construed as to imply that it was either neglected or congealed by an unsympathetic environment. Somewhat of the unusual stimulation and enthusiasm aroused by the passage of the Purnell Act in 1925 had, to be sure, abated as the months had gone by and the new opportunities had become accepted facts. Particularly did this seem to have been true in the field of home economics, where the three-day section program gave little indication that the interests of research were still matters of major concern, although the explanation was suggested that this otherwise surprising condition was merely a temporary reaction from a supposed overemphasis in recent conventions. As regards agricultural research, however, a full and varied program was presented, occupying two sessions of the section program and with considerable of interest and applicability at other sessions.

The research program naturally centered around the experiment station division, which dealt with a number of matters of great importance. It was opened very appropriately with a discussion by Dr. E. W. Allen of the Office of Experiment Stations entitled Some Features of the First Year under the Purnell Act. This period was characterized as the most conspicuous one in the expansion and development of the stations since the national system was started, and the success attending it as "one for sincere congratulation and encouragement." Under the new act the research programs of the stations have been greatly enlarged, strengthened, and enriched. Up to November 1, 1926, 690 new projects had been adopted, of which fully half were in agricultural economics, rural sociology, and home economics.

The effects of so large a program have already been far-reaching. "Usually," as Dr. Allen stated, "it has meant an enlargement of the research field, the selection of new personnel, the setting up of projects of greater definiteness, and the fitting of the new enterprises into the general plan for the stations' activity. . . . A fine disposition

has been manifest to use the new fund in the spirit of the act and of the understanding originally entered into; namely, to conserve it for a substantial type of new investigation, represented by definite projects to which allotments and expenditures are restricted, and incidentally to increase the amount and the range of cooperation in research."

The largest number of Purnell projects is in agricultural economics. All of the States but one have undertaken investigations in this field, and fourteen have set up projects in rural sociology. Of the 224 projects in economics, 107, or about half, relate to marketing, 35 to farm management, and 45 to the economics and costs of production.

The rapid progress in developing the economic field has given ample ground for optimism, but the view was expressed that it also has revealed certain weaknesses from the viewpoint of research policy. The need for thoroughgoing studies, concentrating on specific problems with definite objectives and employing greater detail and precision in methods of procedure was pointed out, as well as the importance of a coordination or association of economic research with that along production lines.

The situation as regards home economics investigations was discussed in some detail. Under the stimulus of the new act, the number of stations carrying on work in this field has been enlarged from 4 to 36, now contributing a total of about 100 projects. "Although work has not been inaugurated at all the stations, no lack of interest or support of this work has been observed. The difficulty has been rather one of finding persons suitably equipped for investigation with the sudden expansion in this field."

Considerable variation in the attitude toward research of the heads of home economics departments in the colleges has been noted. Some, it is reported, "have grasped the idea that successful research requires persons who have had special training for it, and that these are quite as likely to be found in the basic science departments as in those of home economics. Others, however, have evidenced less conception of research and less active interest in developing it, with results that are apparent."

The year was deemed one of profit for many of the home economics workers, the experience of actual investigation proving quite educational. "It has given them a clearer conception of the essential qualities of research and of what this implies on the part of the investigator. The subject of nutrition is better organized than that of home management, for it has been subjected to more research, going back many years, and more persons are available who have had graduate work of a severe type, including advanced research in chemistry and the biologic sciences. In some other branches there

has been considerable evidence of lack of preparation, with consequent difficulty in selecting and organizing suitable projects and carrying them through. The recent development has stimulated institutions to offer graduate courses in these branches, which will doubtless correct the situation in time."

A considerable share of Dr. Allen's paper dealt with observations on the year's developments as to general methods of inquiry, types of experimentation, motives in research, "ready-made" projects, the obligations of the States under the Purnell Act, and the demands of administration. Attention was drawn to the large use being made of the survey method, embracing fully a third of the initial Purnell appropriations, and indicating how largely reliance is being placed upon this method of exploration and investigation. "How adequate it is will be discovered later when more experience has been had and the results come to be published. With some the survey has been conceived to be a quick means of cutting across the tedious path of experiment and investigation. Doubtless it will settle into its real place, but it is important at this stage to consider its limitations, to form a clear conception of what it may be adequate to accomplish, and the manner in which it may need to be supplemented. Evidently many questions that lie out in the field will need field study quite as much as a survey, for often the results of the survey will be tentative, suggestive rather than final, needing to be treated as the beginning or a feature of an investigation and not as the end of it."

The broad question of types of investigation was discussed from the standpoint of the new opportunities for work of a constructive far-reaching character. There are still, it is stated, "many experiments of the purely comparative type which have only a very short-range objective; they have in mind a purely local or temporary situation, a practical question viewed from that standpoint. Such experiments, while attempting to get the practical answer, do not use the opportunity to enlarge the view from the scientific or theoretical standpoint, or go into the matter of causes and relationships. They are supposed to be purely practical, but frequently they are unpractical because they are so limited in their viewpoint and contribute so little real information."

As to motive, Dr. Allen pointed out that the question of making investigation sound and thorough is not one of practical versus fundamental aims, but applies rather to a type of work designed to give results that can be applied intelligently and relied upon in practice. Greater progress in this direction than in any previous year is noted, but among the difficulties still encountered he enumerated a frequent failure in outlining new work to take account of what is already known and the tendency to set up large and comprehensive projects

with little differentiation of the complex problems involved. Complexity, it is pointed out, "ought not to be mistaken for profundity, for in the end it may be found to mean dissipation in the pursuit of many things rather than concentration on something in particular. It may be desirable to have a far-reaching aim, but this is not opposed to taking one step at a time."

In conclusion attention was drawn to the responsibilities of the States in relation to the Purnell legislation. Numerous expressions of opinion by various committees of the association and ratified by the executive body were cited, under which the moral obligation of the States to continue without diminution their support of the stations was set forth in convincing fashion.

The program was continued with a discussion of the social aspects of agriculture in relation to research by Dr. Dwight Sanderson. He conceived the object of what he termed social research to be the discovery of principles of social organization as a means to the readjustment to the changes in conditions whereby a steady drift from farm to town is under way. Rural sociological research he regarded as still in a nascent and unorganized state, with a need for extended structural investigations and with psychological studies of collective behavior a prerequisite. Such matters as the securing of better leaders, types of cooperative effort, the efficacy of "drives," and the adjustment of group conflicts he believed susceptible to inquiry by scientific methods, although he conceded that such results as have been brought out have not always been heeded. This he argued indicated a need for sociological education.

The application of engineering principles to agriculture, particularly as a means of increasing the efficiency of farm production, was a matter touched upon by several speakers during the convention, among them Secretary Jardine, who spoke of it as a "field for significant future development," adding that "modern agriculture can not neglect engineering any more than it can neglect economics." The principal contributions to the discussion of the subject, however, were made by Prof. J. B. Davidson and Mr. H. R. Tolley, both of whom argued for increased efficiency as well as increased production. Professor Davidson's paper took up The Relation of Agricultural Engineering Development to Economic Adjustments in Agriculture, seeing in an increase in efficiency a potential decrease in the proportion of the population engaged in agriculture to as little as 15 per cent. He maintained that despite many contributions along engineering lines the stations had not been large factors in handling the outstanding problems, and he urged a more active participation and leadership. The discovery of additional means of utilizing farm products and by-products was among the specific opportunities which he suggested.

In a paper entitled Organization and Development of the Federal Forest Experiment Stations, Mr. E. N. Munns of the Forest Service outlined the history of this relatively new system of stations and discussed their opportunities and outlook. Numerous analogies between the situation in forestry and that earlier encountered in agricultural research were pointed out, and the belief was expressed that when fully established with adequate staffs of men familiar with forestry principles and practices but trained along broad scientific lines and imbued with the research spirit these stations would be able to perform for forestry a function as vital and far-reaching as the mission of the agricultural experiment stations.

The reports of the three standing committees customarily presented to the experiment station division were this year of unusual importance. That on the publication of research showed a material gain in the promptness of issue of material in the *Journal of Agricultural Research* which was heartily commended. During the year 72 articles appeared in this journal from this Department, 42 from the stations, and 13 on a cooperative basis. A policy of restricting the columns of the journal to the Department and the stations and an increased scrutiny of articles by the committee was announced.

Three timely topics were considered in the report of the committee on experiment station organization and policy, the relation of the nine months' period of employment in the average college year to the twelve months' period in the stations, the necessity of maintaining high standards of research, and the extent to which the Purnell funds should be used for salaries. Of these the matter of time adjustments in college and station work was shown to be somewhat complicated, and the committee recommended a thorough study by the proper administrative authorities. Since it appeared, however, that in more than half of the colleges the salary schedules for nine months' instruction equaled those for the full year of station work, the situation was revealed as one of some seriousness if the station ranks are to be adequately manned and their positions made permanently attractive.

As regards standards of research the committee advocated a more critical habit of thinking, the knowing of more things definitely, and the working toward specific ends and aims. Little excuse was seen for the more superficial types of work or the encroaching on the field of demonstration. The survey method was described as a valuable tool if well handled, but as one with limitations which should be recognized and shortcomings which should be supplemented wherever possible. The responsibility for the maintenance of standards was placed quite definitely with the station director, with the suggestion that staff committees had frequently been found helpful and might

often be made a part of the administrative machinery to good advantage.

The policy of expending the Purnell funds for salaries and relying upon State funds and other sources for supplementary costs was shown to be open to the objections of a lack of definite assurance of means for carrying the projects to completion and the difficulty of segregating clear-cut accomplishments under the act in justification of its passage. Admitting that special circumstances were to be considered in some cases, the committee believed that as a policy the wiser course is to decide upon projects which can be brought to completion with the Purnell funds available and to concentrate upon these, thereby "doing a few things well."

The report of the committee on projects and correlation discussed quite optimistically the progress which had been achieved by the several committees in charge of the so-called "national projects," now numbering 195 as compared with 109 a year ago. A reorganization of the personnel of these committees was suggested and approved, and the new membership was announced last month. The chief gain of the year, however, was declared by the committee to be in the "imponderables," a noteworthy improvement in the attitude of individuals and institutions toward cooperation, a greatly enhanced enthusiasm, and a distinct trend and disposition toward working together, which was deemed extremely encouraging.

The joint session of the three agricultural divisions for the consideration of matters pertaining to research was devoted to a varied program. Dr. A. F. Woods, recently appointed director of scientific work of the U. S. Department of Agriculture, discussed the type of research needed at the present time for the advancement of agriculture. He emphasized the desirability of a frequent recrystallization of our knowledge in the light of new facts and the need of a certain amount of constructive speculation for which men broadly trained are required. The advantages of carefully considered cooperation in research, both among individuals and institutions, and the possible development of centers of major research activity in special fields were also set forth. These views are, of course, in close agreement with those often expressed by the association in recent years and indicated an attitude of sympathetic understanding conducive to closer relations.

Under the title of Keeping Contacts with Farmers as an Asset to Organizing Research Work for Agricultural Experiment Stations, Director H. W. Mumford showed how the development of the extension work had operated as a wedge between the stations and the farmers and resulted in a loss of contacts which had many

disadvantages. More intimate relations between the extension specialists and the stations were advocated, and Director Mumford explained in some detail the plan followed in Illinois of conferences of farm advisors and station workers, the farmers' field days at the thirty-three experimental soil fields, and the identification through farmers' advisory committees of the organized agriculture of the State with the station work. The maintenance of such contacts he believed to be productive of increased zeal and enthusiasm, as well as tending toward a surer selection of the really important subjects for research.

An illustrated address by Dr. W. H. Larrimer of the Bureau of Entomology on the European corn borer and the research attack concluded the session. Dr. Larrimer showed the serious nature of the ravages of this pest over a steadily increasing area and the need of holding it in check as effectively as possible pending the discovery of more adequate measures for its control.

Provision was also made in the session of the section assigned to extension interests for a discussion by representatives of research and extension of the "twilight zone" between these agencies. Speaking for research, Dr. Allen pointed out as the fundamental distinction that the field of research is the unknown and of extension the known; one is a process of learning, the other a type of teaching. "In a word, the man of research adds his scientific contributions and makes his science practical; the extension worker puts these things to work and thereby makes practice more scientific. If these principles are observed by each, the boundaries of No Man's Land will shrink and there will be less likelihood of overlapping."

Regarding the realm of demonstrations or field trials, which to many has seemed a debatable land, Dr. Allen had this to say: "The utilitarian aim of agricultural research implies the obligation to carry such work to a point where, in its essentials, it is workable and demonstrable. It will not do to discover the bald fact under laboratory or purely experimental conditions and leave it there, as is often done in pure science; it must be harmonized with practical conditions, and the result placed before the public as promptly as possible. So far as field work employs farming people to test out the results of experiments in order to verify them and make them practical, it is in the field of applied research; but when it is designed to assist farmers in demonstrating things to themselves it is in the realm of extension. On the other hand, the extension worker is not warranted in setting up a series of experiments because he needs information or because he encounters difficulties with the results supplied him which indicate they are not practical. If such difficulties and doubts arise, the natural course leads back to the investigator for further test and adaptation."

Assistant Extension Director W. B. Mercier of Louisiana presented the matter from the extension viewpoint, but with surprisingly close agreement with Dr. Allen's conclusions. Little trouble would arise, in his opinion, if the stations could supply reliable information on all the problems with which the extension workers are confronted, but until this can be done they will naturally endeavor to secure information from all available sources. None the less, the belief was expressed that the extension man should stick to his own field, and that the hybrid research-extension worker is not likely to be very successful in either direction. The formal experiment, he conceded, should be left to research, and the tendency sometimes encountered to start experimental plats in demonstrations may be expected to yield results which are seldom very reliable and often quite misleading. The better and surer way to real progress is through close relations and contacts between extension and research, particularly as regards the selection of experimental projects and the prompt utilization of well-proved findings.

The attendance at the various sessions devoted to research was excellent, and the almost complete absence of discussion from the floor was doubtless due less to a lack of interest than to the congested program. It would seem that somewhat more time could have been utilized profitably at various points. Many of the papers dealt with matters of special timeliness, and their presentation served to visualize their importance and encourage their further consideration. Such consideration is particularly well warranted by a number of the administrative questions which were raised, and it is to be hoped that a definite association policy may ultimately be forthcoming concerning them.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Chemistry of the proteins and its economic applications, D. J. Lloyd (*London: J. & A. Churchill, 1926, pp. XII+279, figs. 50*).—This monograph, which has an introduction by F. G. Hopkins, presents in a concise manner the theories of protein chemistry and their practical applications to biology and industry. Part 1, which considers the constitutional chemistry of the proteins, contains chapters on the nature and constitution of the proteins, the methods of protein analysis, the different classes of proteins, the identification of proteins and the structure of the protein molecule, the proteolytic enzymes and the linkages in the protein molecule, the chemistry of protein foods, and the problems of food preservation. Part 2 deals more particularly with the physical chemistry of the proteins leading up to the industrial uses of the proteins in textile and leather manufacture, as adhesives, and as emulsifying agents. A comprehensive bibliography is given at the end of each chapter.

Some nitrogenous constituents of the cauliflower bud.—I, Protein fractions, M. C. McKee and A. H. Smith (*Jour. Biol. Chem., 70 (1926), No. 1, pp. 273–284*).—A study of the nitrogen distribution in the edible portion of the cauliflower is reported, with the following results:

Of the total nitrogen, approximately 68 per cent belongs to constituents soluble in water and dilute salt solution, 12 per cent to compounds insoluble in water but soluble in dilute alkali, and 10 per cent to compounds insoluble in both water and dilute alkali. Fractionation of the combined expressed juice and aqueous extract yielded 8 per cent of the total nitrogen as ammonia nitrogen, 19 per cent as free amino nitrogen, and 11 per cent as nitrogen in actually isolated protein preparations. The purest proteins obtained contained 14.1 and 13.6 per cent of nitrogen in the coagulum and precipitate, respectively. The distribution of nitrogen as obtained by the Van Slyke method was similar to that of the alfalfa protein as reported by Chibnall and Nolan (E. S. R., 52, p. 802) and spinacin from spinach by Chibnall (E. S. R., 52, p. 708).

Simpler nitrogenous constituents of yeast.—I, Choline and nicotinic acid, H. B. Vickery (*Jour. Biol. Chem., 68 (1926), No. 3, pp. 585–592*).—The methods previously employed in the study of the nitrogenous substances in alfalfa juice (E. S. R., 54, p. 408) have been applied to a similar study of the cell constituents of brewers' yeast. The present paper includes a brief description of the methods employed for the fractionation of the yeast extract and the results of the examination of the basic substances not precipitated by Neuberg's reagent. "These contained nitrogen equivalent to 3.35 per cent of the nitrogen of the yeast extract. When fractionated with mercuric chloride in acid solution, 2.41 per cent of the nitrogen of the yeast extract was found in the precipitate. Of this nitrogen about 86 per cent belongs to choline and 6 per cent to nicotinic acid. Further quantities of nicotinic acid were found in the filtrate from the mercuric chloride precipitate. Choline was found to account for 2.07 per cent of the nitrogen of the yeast extract and 0.29 per

cent of the nitrogen of the dry yeast. Nicotinic acid accounts for 0.28 per cent of the nitrogen of the extract and 0.039 per cent of that of the dry yeast."

The chemical composition of rice oil, G. S. JAMIESON (*Jour. Oil and Fat Indus., 3 (1926), No. 8, pp. 256–261*).—The chemical and physical characteristics of a sample of rice oil extracted from rice bran by ethyl ether are reported as follows: Refractive index 25° C. 1.4690, acid value 73.67, iodine number (Hanus) 99.9, saponification value 185.3, saponification value corrected for unsaponifiable 194.2, unsaponifiable matter 4.64 per cent, saturated acids (corrected) 14.70 per cent, unsaturated acids (corrected) 74.30 per cent, Reichert-Meissl value 0.3, and Polenske value 0.3. The distribution of the glycerides of fatty acids is given as oleic 41 per cent, linoleic 36.7, myristic 0.3, palmitic 12.3, stearic 1.8, arachidic 0.5, lignoceric 0.4, and unsaponifiable matter 4.6 per cent. Sterols were isolated to the extent of 25 per cent of the unsaponifiable matter and ranged in melting points from 137 to 143°.

The hemicelluloses.—Part IV, The hemicelluloses of beech wood, M. H. O'DWYER (*Biochem. Jour., 20 (1926), No. 4, pp. 656–664*).—In this report to the Forest Products Research Board, Department of Scientific and Industrial Research, Great Britain, in continuation of studies previously noted (E. S. R., 50, p. 310), the author reports the isolation from beech wood of two hemicelluloses, one, hemicellulose A directly precipitable by acid and, the other, hemicellulose B obtained on precipitation from the acid filtrate by alcohol. The former on hydrolysis yielded xylose and carbon dioxide equivalent to 11 per cent of glycuronic acid, and the latter arabinose and carbon dioxide corresponding to 63 per cent of galacturonic acid, together with small amounts of galactose.

A comparison of various methods of obtaining ash-free pectin, A. M. EMMETT (*Biochem. Jour., 20 (1926), No. 3, pp. 564–568, fig. 1*).—A comparison is reported of the efficiency of three methods of removing mineral impurities from pectin—dialysis against distilled water, dialysis against N/50 HCl, and electrodialysis. Electrodialysis, the apparatus for which is described and illustrated, was found to be the most rapid and effective method of the three. It was found necessary to use the platinum electrode as the anode. With certain necessary precautions, such as reducing the heating effect as much as possible and changing the water in the dialyzer daily, it was found possible to reduce the ash of a sample of commercial pectin from 3.1 to 0.5 per cent in three days.

Antiricketic substances.—IV, The polymerization of cholesterol, C. E. BILLS and F. G. MCDONALD (*Jour. Biol. Chem., 68 (1926), No. 3, pp. 821–831, pls. 3, figs. 2*).—Continuing the investigation previously noted (E. S. R., 55, p. 711), the authors report that by slowing up the catalytic action of activated floridin on cholesterol it is possible to obtain a polymer, tentatively named tricholesterol. This has no antirachitic properties, but on further catalytic action forms a resinous mass having antirachitic properties though apparently not identical with irradiated cholesterol. The physical and chemical properties of tricholesterol are summarized.

Colour reactions attributed to vitamin A, F. H. CARR and E. A. PRICE (*Biochem. Jour., 20 (1926), No. 3, pp. 497–501*).—In experiments undertaken with a view to improving the technique for the Rosenheim-Drummond color test for vitamin A (E. S. R., 55, p. 307), it was found that the color reaction with trichloroacetic acid is apparently due to impurities in the acid and is not given by specially purified samples. Arsenic trichloride was found to be fairly satisfactory except for a marked loss of sensitiveness on dilution with chloroform or other solvents. Among other reagents tested, color reactions consisting in the main of blue, with varying proportions of red, were given by antimony

trichloride in chloroform, stannic chloride in chloroform, anhydrous ferric chloride added to a solution of the oil in chloroform, anhydrous aluminum chloride, silicon tetrachloride, and phosphorus oxychloride. Of these reagents, antimony trichloride proved to be the most satisfactory.

The technique for its use is as follows: Antimony trichloride is washed with a little B. P. chloroform, dried, weighed, and dissolved in chloroform to make a 30 per cent solution, which, after standing, is decanted and used in a burette. Two cc. of the solution is added to 0.2 cc. of a 20 per cent solution of the oil in chloroform, and the color intensity of the liquid is at once measured against standard glasses in a Lovibond tintometer. The results obtained on four oils are given, together with a report by S. W. F. Underhill of biological tests conducted with two of the oils. These corresponded closely to the ratios of blue of the two oils as determined in the colorimeter.

The concentration of vitamin B, III, P. A. Levene and B. J. C. van der Hoeven (*Jour. Pharmacol. and Expt. Ther., 29 (1926), No. 1, pp. 227-231*).—Further improvement in the authors' method of concentrating vitamin B from the Osborne-Wakeman yeast fraction is reported which is said to increase the yield from previous values of 3 to 5 per cent to 35 to 50 per cent of the starting material, as well as to furnish some clue as to the chemical properties of this vitamin. The successive steps in the improved method are briefly as follows:

The Osborne-Wakeman fraction is extracted repeatedly with absolute alcohol until a dry nonhygroscopic powder is obtained. This is dissolved in water and adjusted to pH 4, at which reaction some inactive material precipitates out on standing. The active material is deaminized with barium nitrite and sulfuric acid, involving a loss in material not exceeding 10 per cent, and is then adsorbed on silica gel and extracted from it as described in the previous paper.

"The final product obtained is still a complex mixture, containing complex carbohydrates and nitrogenous substances and esters of phosphoric acid. It contains no amino nitrogen, but does contain sulfur, which is given off on treatment with alkali in the form of hydrogen sulfide. The sulfur content increases with purification, but it is premature to pass an opinion as to whether the sulfur is a part of the active substance."

Some observations on the extraction of the vitamin B from wheat germ, E. V. McCollum and H. D. Kruse (*Amer. Jour. Hyg., 6 (1926), No. 2, pp. 197-200*).—In an attempt to find solvents for vitamin B by the use of which selective extraction of the vitamin from natural foods might be effected with minimum contamination of other substances, extracts were prepared from wheat germ with 95 per cent alcohol containing 1 per cent of various organic and inorganic acids. The solubility of vitamin B in these extracting agents was tested by using the extract as the sole source of vitamin B in feeding experiments on young rats, using the technique previously described (E. S. R., 38, p. 612).

Of the various extracts tested, those prepared from alcohol containing 1 per cent of phosphoric, hydrochloric, nitric, benzoic, or lactic acid gave results indicating the presence of vitamin B. The best results were obtained with solutions of tannic and gallic acids in the alcohol. Citric acid gave negative and acetic acid irregular results. Further tests with the alcohol-gallic acid solvent indicated that the greater part of the vitamin B which can be extracted by this agent is removed within a relatively short time.

Similar tests, using as the solvent 95 per cent alcohol containing 1 per cent of cupric, mercuric, calcium, strontium, zinc, or cadmium chloride or silver nitrate, gave negative results with all except the zinc and cadmium salts, which yielded extracts more active than those obtained with the alcohol alone.

A comparison of the pigeon and the rat as test subjects for vitamin B, C. N. LAIRD (*Amer. Jour. Hyg., 6 (1926), No. 2, pp. 201–210*).—Continuing along the lines of the foregoing study, wheat germ was extracted with a 0.5 per cent solution of various organic acids in acetone, benzene, chloroform, and ether and the extracts tested for vitamin B by the usual feeding experiments on rats. In an effort to determine whether rats and pigeons are comparable subjects for vitamin B tests, the curative power of these extracts for pigeons in acute polyneuritis was also tested.

The tabulated results show a decided variation in the effect of the different extracts on the two species of animals. Citric acid in acetone gave negative results in the rat tests, but was effective, although somewhat slow in action, in the pigeon tests. Salicylic acid in acetone, on the other hand, gave excellent rat tests and negative pigeon tests. Some gave fair results and others negative with both species. Combinations of two preparations each of which alone gave negative results with rats were also tested on both rats and pigeons. Although some of these combinations gave positive results with rats, the results, together with those obtained with the single preparations, are thought to be too inconclusive to furnish definite proof as to whether what is known as vitamin B is a single substance or of multiple nature, or as to whether the B requirements of the pigeon are simpler than those of the rat.

The action of reducing agents on the antiscorbutic factor inactivated by aeration, C. G. DAUBNEY and S. S. ZILVA (*Biochem. Jour., 20 (1926), No. 3, pp. 519–523*).—On the assumption that the inactivation of vitamin C by oxidizing agents is direct oxidation and that the activity may conceivably be regenerated by reduction, attempts were made to reduce decitrated lemon juice inactivated by aeration by hydrogen in the presence of platinum black as a catalyst, by electrolysis, and by nascent hydrogen obtained by the action of citric acid on magnesium. Duplicate feeding tests were run with nonaerated juice which had received the same hydrogenation treatment.

No protection against scurvy was secured with the aerated but protection with the nonaerated juice after the hydrogenation treatment by the first two methods. Reduction by magnesium and citric acid gave inconclusive results as the preparation in itself had a disturbing effect on the animals. It is concluded that inactivated vitamin C can not be regenerated by simple reduction.

Rapid preparation of monomolybdophosphotungstic acid, reagent of polyphenols and vitamins [trans. title], N. BEZSSONOFF (*Compt. Rend. Acad. Sci. [Paris], 182 (1926), No. 20, pp. 1223, 1224*).—A more rapid method for the preparation of the reagent proposed for the estimation of vitamin C (E. S. R., 49, p. 805) is described as follows: In 250 cc. of water distilled over permanganate are dissolved 74 gm. of sodium tungstate, 8 gm. of phosphomolybdic acid, and 10 cc. of concentrated orthophosphoric acid (specific gravity 1.75). To this solution, kept at 45° C., is added drop by drop 85 cc. of 1:1 solution of concentrated sulfuric acid in redistilled water. On cooling crystallization is complete in three hours. The crystals are further purified by washing with 50 cc. of 15 per cent sulfuric acid by volume, dissolving them in 100 cc. of redistilled water at 45°, reprecipitating with 35 cc. of 50 per cent sulfuric acid, and washing the crystals with 15 per cent sulfuric acid.

A vacuum extractor for biochemical use, N. B. GUERRANT (*Indus. and Engin. Chem., 18 (1926), No. 10, p. 1090, fig. 1*).—A vacuum extractor said to be particularly useful when the effect of heat and oxidation must be maintained at a minimum, as in the preparation of materials for nutritional studies, is described and illustrated.

"The flask is of the thick-walled Pyrex balloon type, having 10 per cent greater capacity than the extraction chamber. The extraction chamber consists of a side-necked bell jar containing a perforated desiccator plate and covered with a well-fitting desiccator top. The two ground surfaces are sealed with a mixture of equal parts of vaseline and paraffin previously melted and well mixed. The condenser should be short, thick-walled, and have a maximum cooling surface. The Davies condenser serves the purpose very satisfactorily. The exhaust tube should be as far as possible from the path of the condensed vapor."

Hydrogen ion concentration: Its significance in the biological sciences and methods for its determination.—I, Principles of the theory, L. Michaelis, trans. by W. A. Perlzweig (*Baltimore: Williams & Wilkins Co., 1926, 2. ed., rev. and enl., vol. 1, pp. XIV+299, figs. 32*).—This is the authorized translation of the second German edition (E. S. R., 48, p. 412).

Apparatus for the direct determination of carbon dioxide, J. E. Underwood (*Indus. and Engin. Chem., 18 (1926), No. 10, pp. 1069, 1070, fig. 1*).—A simple form of apparatus for the determination of small amounts of carbon dioxide by absorption is described and illustrated.

The gas is set free by hydrochloric acid and passed through successive absorption tubes containing water, mossy zinc (to absorb any hydrochloric acid passing over), concentrated sulfuric acid, and phosphorus pentoxide, and is finally absorbed by Ascarite in an ordinary Midvale bulb. The advantages claimed for the apparatus are the rapid removal of contaminating gases, the use of liquids in the various units which have to be replaced, and rapidity of determination owing to the small volume of the apparatus.

The colorimetric estimation of tyrosine, tryptophane, and cystine in proteins, II, J. M. Looney (*Jour. Biol. Chem., 69 (1926), No. 2, pp. 519–538*).—This paper consists of a critical discussion of various methods of determining tyrosine and tryptophane and the report of a repetition of the analyses of various proteins by the colorimetric method of Folin and Looney described in the previous paper of the series (E. S. R., 47, p. 504).

The earlier results were confirmed with the exception of the tyrosine content of gliadin and edestin and the cystine content of zein. The new figures for these are more consistent than the earlier figures with the values reported by Folin and Denis and by Jones, Gersdorff, and Moeller (E. S. R., 52, p. 802).

Comparison of the Official method of ashing plant tissues and products with the Hertwig and Bailey method, C. F. Rogers (*Cereal Chem., 3 (1926), No. 4, pp. 226–232*).—A comparison of the Official and the Hertwig-Bailey (E. S. R., 53, p. 314) methods for determining ash is reported for sweet corn dried in the milk stage, apple wood, pea seeds, corn smut spores, and Graham flour, these materials being taken as representative of tissues high in sugars, cellulose, protein, fat, and starch, respectively. Although the difference in accuracy between the two methods was not great, it is considered that "the saving of time alone made possible by the Hertwig and Bailey method, without any serious consequences in regard to accuracy and with the higher apparent ash content when constant weight is reached, makes this modification of the standard method worthy of careful consideration."

Report of committee on methods of analysis for American Association of Cereal Chemists, D. A. Coleman et al. (*Cereal Chem., 3 (1926), No. 4, pp. 254–282, fig. 1*).—Collaborative data on the technique of making protein determinations, with emphasis on the standardization of acid and alkalies employed, and recommended methods for making protein, ash, and moisture tests on wheat flour and mill feeds constitute the main part of this annual report (E. S. R., 54, p. 613).

Oxygen-acetate method of ash determination in flour, G. L. BRENDEL (*Cereal Chem.*, *3 (1926)*, *No. 4*, *pp. 222–226*).—In this modification of the calcium acetate method of ash determination the flour in a porcelain or platinum crucible is first charred to a cinder in the muffle, the calcium acetate solution is added and allowed to evaporate by placing the crucible on the open muffle door, and the ashing is then carried on at about 1,500° F., with the introduction into the muffle of oxygen from an oxygen acetylene torch for 10 or 15 minutes. It is stated that the analysis can be completed within 45 minutes.

On the estimation of glucose in the presence of phosphate buffers, M. B. VISSCHER (*Jour. Biol. Chem.*, *69 (1926)*, *No. 1*, *pp. 1, 2*).—Attention is called to the fact that the presence of potassium acid phosphate in glucose solutions lowers the reducing power of the glucose for copper, and that this must be taken into account whenever the sugar content of buffer solutions is to be measured.

The quantitative estimation of calcium, magnesium, phosphate, and carbonate in bone, B. KRAMER and J. HOWLAND (*Jour. Biol. Chem.*, *68 (1926)*, *No. 3*, *pp. 711–719*).—Methods are described for the quantitative determination of calcium, magnesium, inorganic phosphorus, and carbonate in from 0.5 to 1 gm. of bone.

The method for calcium and magnesium is a modification of the authors' method for calcium determination in blood serum (E. S. R., 44, p. 114) and that for phosphorus a modification of the method of Fiske for the determination of phosphates in urine (E. S. R., 45, p. 508). A modification of the Briggs method for phosphorus (E. S. R., 48, p. 111) is also recommended. The method for carbonate consists essentially in its determination as carbon dioxide gas in an enlarged form of the apparatus described originally by Van Slyke for the determination of bicarbonate in small amounts of serum.

The technique of each of these methods is described in detail, with data indicating that the accuracy of the calcium method is ±1 per cent, phosphorus ±2, carbonate ±1, and magnesium ±5 per cent.

The colorimetric estimation of cholesterol and lecithin in blood in connection with Folin and Wu's system of blood analysis, D. M. DETONI (*Jour. Biol. Chem.*, *70 (1926)*, *No. 1*, *pp. 207–210*).—In the method described the protein precipitate obtained by the method of Folin and Wu (E. S. R., 41, p. 13) is washed, dried, and extracted with hot chloroform as in the method of Myers and Wardell for total blood (E. S. R., 40, p. 15). The cholesterol is determined in the extract by the Liebermann reaction and the lecithin as lipoid phosphorus by the Whitehorn method (E. S. R., 53, p. 12).

The metabolism of sulfur.—X, The determination of cystine in the urine, H. B. LEWIS and R. H. WILSON (*Jour. Biol. Chem.*, *69 (1926)*, *No. 1*, *pp. 125–131*).—In this continuation of the series of studies previously noted (E. S. R., 54, p. 292), a comparison has been made of the Looney colorimetric (E. S. R., 48, p. 505), the Gaskell gravimetric, and the Magnus-Levy polarimetric methods for the estimation of cystine in urine, with the conclusion that the direct colorimetric procedure is more accurate than methods involving precipitation, particularly where small amounts of cystine are concerned.

A respiration apparatus for small animals, G. L. FOSTER and E. S. SUNDSTROEM (*Jour. Biol. Chem.*, *69 (1926)*, *No. 2*, *pp. 565–568*, *fig. 1*).—A respiration apparatus of the closed circuit type, which is said to have given satisfactory service in determinations of the metabolism of rats under various conditions, is described and illustrated.

The carbon dioxide absorbers, consisting of two pairs of Kjeldahl flasks joined at the bottom, are arranged on a motor-driven rocking apparatus which causes the absorbing solution of barium hydroxide to flow back and forth

from one flask to the other, thereby drawing the air out of the animal chamber. This consists of an ordinary desiccator, the animal resting on a wire gauze over sulfuric acid. The oxygen reservoir is a 1½ liter bottle fitted with a manometer tube and connected by a two-way stopcock with the animal chamber or the atmosphere. The pressure is kept constant by admitting water into the reservoir drop by drop from a burette through the manometer tube.

METEOROLOGY

Solar activity and long-period weather changes, H. H. CLAYTON (*Smithsn. Misc. Collect., 78 (1926), No. 4, pp. 62, figs. 13*).—This paper is a continuation of one previously noted (E. S. R., 53, p. 812). It is stated that "the results of these studies indicate that there is a real relation between weather conditions and the monthly means of solar radiation and monthly sun-spot numbers, but in the average the amounts of the changes in pressure, temperature, and precipitation are not large." Twenty correlation coefficients and other evidential results favorable to solar variation and its influence on weather are presented.

Solar radiation and weather forecasting, C. F. MARVIN and H. H. KIMBALL (*Jour. Franklin Inst., 202 (1926), No. 3, pp. 273–306, figs. 23*).—This is a very complete review, with a bibliography of the more important investigations on this subject. The general conclusion reached is that "the basis for our belief that the weight assignable to solar variability as a factor in the making of the weather is almost vanishingly small," but that this does not mean that "meteorologists in general and weather forecasters in particular are not to benefit from more accurate determinations of the value of the solar constant."

Rain making and other weather vagaries, W. J. HUMPHREYS (*Baltimore: Williams & Wilkins Co., 1926, pp. X+157*).—This book summarizes both ancient and modern notions about the control of rain, or what Dr. David Starr Jordan has termed "pluviculture," as well as other weather vagaries, which the author terms "meteorological mumpsimuses, or stupid weather errors stubbornly held to, despite all rational explanations."

Influence of temperature and precipitation on vegetation [trans. title], W. GROSSE (*Met. Ztschr. [Brunswick], 43 (1926), No. 9, pp. 352–355*).—A number of correlations which are thought to be significant are indicated.

The weather influence on crop production in regions of scanty rainfall, W. A. MATTICE (*U. S. Mo. Weather Rev., 54 (1926), No. 8, pp. 336–341, figs. 3*).—A study of the relation of precipitation and temperature to yields of winter and spring wheat, oats, barley, and corn in a region of scanty rainfall (Akron, Colo.), as compared with regions of generally adequate summer precipitation, indicated that "growing dry-land crops under conditions such as exist at Akron is decidedly precarious." Of the five crops referred to, winter wheat alone showed an even chance of giving an average yield.

A further study of effective rainfall, J. F. VOORHEES (*U. S. Mo. Weather Rev., 54 (1926), No. 8, pp. 332–336, figs. 9*).—Supplementing a paper previously noted (E. S. R., 53, p. 210), the author reports a study of the relation of rainfall to yield of corn on differently cultivated and treated soils, from which he concludes that "effective rainfall is not a function of total rainfall (except when the latter is the limiting factor), but depends entirely upon the condition of the soil and the capacity of the crop for utilizing water."

Spring and autumn night frosts as a problem of agricultural meteorology [trans. title], K. SZULC (*[Poland] Min. Roln. i Dóbr Państ., Prace Met. i Hydrog. (Études Mét. et Hydrog.), Ser. F, No. 1 (1924), pp. 3–6; Fr. abs., pp. 5, 6*).—This is a brief preliminary note discussing the use of Pearson curves as a means of predicting the dates of occurrence of frosts.

Monthly Weather Review, [July–August, 1926] (*U. S. Mo. Weather Rev., 54 (1926), Nos. 7, pp. 281–320, pls. 10, figs. 16; 8, pp. 321–365, pls. 10, figs. 20*).—In addition to detailed summaries of meteorological and climatological data and weather conditions for July and August, 1926, and bibliographical information, notes, abstracts, and reviews, these numbers contain the following contributions:

No. 7.—Lightning and Forest Fires in the Northern Rocky Mountain Region (illus.), by H. T. Gisborne; The January Storms over the North Atlantic and the Strophs of the Greenland Anticyclone (illus.), by W. H. Hobbs; On the Investigation of Cycles and the Relation of the Brückner and Solar Cycle (illus.), by A. Streiff; and The Nassau Hurricane, July 25–26, 1926 (excerpts).

No. 8.—The Vertical Distribution of Atmospheric Eddy Energy (illus.), by C. G. Rossby; A Further Study of Effective Rainfall (illus.), by J. F. Voorhees (see p. 15); The Weather Influence on Crop Production in Regions of Scanty Rainfall (illus.), by W. A. Mattice (see p. 15); A Note on Mr Mitchell's Paper on West Indian Hurricanes, by S. Hanzlik, with discussion by C. L. Mitchell; and Compensation of Altimeters and Altigraphs for Air Temperature, by W. G. Brombacher (abs.).

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. Ostrander and W. H. Parkin (*Massachusetts Sta. Met. Buls. 453–454 (1926), pp. 4 each*).—The usual summaries are given of observations at Amherst, Mass., during September and October, 1926.

Climate of British Columbia, F. N. Denison (*Brit. Columbia Dept. Agr. Bul. 27, 11. ed. (1926), pp. 24*).—Data from nearly 200 stations distributed throughout British Columbia, with reference to monthly and annual temperature, precipitation, sunshine, and relative humidity, are tabulated.

"During the year 1925 the temperature was abnormally high, both in British Columbia and the Yukon; severe floods occurred at Dawson and in the Lower Fraser Valley in May, and owing to the summer being unusually hot and dry, forest fires were both numerous and very destructive throughout this Province. The precipitation for the entire year was considerably below the average."

The weather of Scotland in 1925, A. Watt (*Highland and Agr. Soc. Scot. Trans., 5. ser., 38 (1926), pp. 275–283*).—A general description is given of the weather of each month, with a table showing rainfall in different counties. The most notable feature of the year was a rainfall deficiency in June and November.

Phenological observations in Italy, 1922–1925 [trans, title], M. Minio (*Nuovo Gior. Bot. Ital., n. ser., 33 (1926), No. 3, pp. 627–631+[48]*).—Dates of blooming of a large number of trees, shrubs, and other plants are recorded for various places in Italy. The plan and program of the cooperative observations on this subject are briefly described.

Meteorological observations in the Dooars, 1925, C. R. Harler (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1926, No. 2, pp. 61–72, pls. 2*).—The relation of weather conditions in this region of Assam to the growth and quality of tea is discussed, attention being called especially to humidity as the controlling factor in the growth of the indigenous tea bush. The Assam tea plant "is constructed to live in a hot, humid climate and its leaves are designed so that they are able to transpire freely. The leaves of China bushes are slightly differently made from those of Assam and Burma bushes, and the China jat is able to withstand the drought and cold better than the other varieties."

SOILS—FERTILIZERS

Transactions of the Second Commission of the International Society of Soil Science, A. A. J. VON 'SIGMOND, N. M. COMBER, H. R. CHRISTENSEN, and D. J. HISSINK (*Groningen: Internatl. Soc. Soil Sci., 1926, vol. A, pp. [6]+248, pls. 3, figs. 28*).—The transactions of the meeting of this commission, held at Groningen in April, 1926, contain special articles on The Determination and the Value of Soil Acidity, by O. Lemmermann; Soil Acidity, by S. D. Conner; Use of the Quinhydrone Electrode for Determining the pH of Soil, by C. Brioux and J. Pien; Value of Iron in Zeolitic Silicates to Soil Reaction, by L. Smolik; The pH Determination of Soils According to the Biilmann Chinhydrone Method, by D. J. Hissink and J. van der Spek; Soil Acidity, by O. Arrhenius; The Action of Nondiffusible Ions in Soil Phenomena, by N. M. Comber; Soil Acidity and Plant Reaction, by E. A. Mitscherlich; Soil Reaction in Finland, by W. Brenner; Some Comparative Investigations on the Determination of Exchangeable Cations, Saturation Condition, and Acidity Conditions in Soil, by A. A. J. von 'Sigmond; Titration Curves of Humus Soils, by D. J. Hissink and J. van der Spek; The Quantitative Determination of the Lime Requirement of Soil, by H. R. Christensen and S. T. Jensen; The Quantitative Determination of the Lime Requirement of Humus Sand Soils, by J. Hudig; The Effect of Regulated Treatment with Hydrochloric Acid upon the Lime Requirement of a Mineral Subsoil, by G. Milne; The Reaction between Soils and Hydroxide Solutions, by S. J. Saint; Observations on the Relation of Soil Reaction and Plant Yield, by L. von Kreybig; Determination of the Lime Requirement of Braunschweig Soils, by A. Gehring, A. Peggau, and O. Wehrmann; The Characterization of the Soil on the Basis of its Absorbing Complex, by G. W. Robinson; What Happens to the Lime when Soil is Limed? by D. J. Hissink; The Relation between the Values pH, V, and S (Humus) of Some Humus Soils, S (Humus) and V of These Soils with pH = 7, the Equivalent Weight of the Humus Substance, by D. J. Hissink; and The Relation between Soil Acidity and the Physiologically Acid Reaction of Fertilizers, by H. Kappen.

A suggestion concerning soil classification, A. B. BEAUMONT and A. C. SESSIONS (*Jour. Amer. Soc. Agron., 18 (1926), No. 3, pp. 238–247, figs. 3*).—In a contribution from the Massachusetts Experiment Station a statistical study of mechanical analyses is presented which indicates that agricultural soils are composed of mixtures of soil separates rather than any one group of particles known as a separate, and that agricultural soils containing more than 75 per cent of clay, more than 85 per cent of silt, or more than 95 per cent of sand are negligible in number. Evidence is given of variability in soils and of the failure of plants to respond to slight textural differences. A revision of the textural classification of soils is suggested which would eliminate ambiguity and tend to check the multiplication of class names.

Soil survey of Iowa.—Reports 42, 43, W. H. STEVENSON, P. E. BROWN, ET AL. (*Iowa Sta. Soil Survey Rpts. 42 (1926), pp. 79, pls. 2, figs. 14; 43, pp. 70, pl. 1, figs. 12*).—Two county soil surveys are presented, which include analyses and greenhouse and field experiments to determine the composition, fertilizer requirements, and crop adaptations of the prevailing soil types, and information on methods of conducting soil surveys in Iowa.

No. 42, Jasper County soils.—This county lies mainly in the Mississippi loess soil area in central Iowa and has an area of 467,200 acres. The topography is mainly rolling to strongly rolling. Drainage conditions as a whole are said to be quite satisfactory except in the northwestern corner where the Wisconsin drift soils occur.

The soils are grouped as drift, loess, terrace, and swamp and bottomland soils, the loess soils covering 62.5 per cent of the area. Including peat and muck, 33 soil types of 18 series are mapped, of which the Tama and Clinton silt loam loess soils and the Carrington loam drift soil cover 42.3, 12.8 and 10.1 per cent of the area, respectively. Practically all of the soils are said to be acid in reaction, and in many cases the nitrogen content is not entirely adequate. The phosphorus content is also said to be low.

No. 43, O'Brien County soils.—This county lies partly in the Wisconsin drift soil area and partly in the Missouri loess area in northwestern Iowa, and has a total area of 364,160 acres. The prevailing topography is level to undulating. It is considered apparent that while the drainage is quite adequate in parts of the county, considerable areas need artificial drainage.

The soils of the county are grouped as drift, loess, terrace, and swamp and bottomland soils, the loess soils covering 72.8 per cent of the area. Fifteen soil types of 12 series are mapped, of which the Marshall silt loam loess soil covers 72.8 per cent of the area. It is stated that many of the individual soil types of the county are acid, and that the soils are generally rather low in phosphorus.

Soil survey of Rockwall County, Texas, H. V. Geib (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1923, pp. III+123-152, pls. 4, fig. 1, map 1*).—This survey, made in cooperation with the Texas Experiment Station, deals with the soils of an area of 95,360 acres in northeast Texas. It lies in the black waxy belt of the Black Prairie region. The topography ranges from gently undulating to strongly rolling and hilly, the greater part being rolling. It is stated that numerous streams and their branches ramify to all parts of the uplands, affording excellent outlets for the surface waters. In many places the run-off is rapid and damaging erosion is taking place.

The soils of the county are derived principally from the underlying highly calcareous beds of unconsolidated or only very weakly consolidated clays. Eight soil types of 5 series are mapped, of which the Houston clay and black clay and the Trinity clay cover 38.1, 28.1, and 18 per cent of the area, respectively.

Soil colloids [trans. title], A. N. Sokolovskiĭ (Sokolowsky) (*Pochvovedenie (Pédologie), n. ser., 19 (1924), No. 1-2, pp. 59-79; Ger. abs., pp. 77-79*).—Studies are reported which showed that the content of absorbed calcium in soils has an approximate relation to certain soil properties. Separation of the absorbed calcium from black soil and subsequent washing with distilled water resulted in the removal of a part of the soil colloid, and caused the rapid disappearance of the filtering property of the soil. It became very slimy when wet and very hard when dry, and no trace of crumb structure remained.

Soluble organic and mineral matter was also removed by this procedure, leaving considerable quantities of insoluble humus and slime which produced the compact structure on drying.

The silt content could be removed only by breaking down the connection between the humus and the slime either by oxidation of the humus or by boiling. Crumb structure was found to be governed by the presence of organic and mineral or so-called active silt and by the degree of absorption of calcium. These factors were at the optimum in black soils and were in minimum in forest, alkali, and desert soils.

The mineral and organic materials forming the active silt were for the most part not combined. The more disperse organic matter consisted of a mixture of particles of variable dispersion. It was possible to dissolve out the more disperse organic material from active silt. Only an insignificant part of the

colloidal complex of gravelly loam was removed in this matter as compared with that removed from black soil.

Active silt showed ordinary colloidal properties under the influence of heating from 40 to 60° C. (104 to 140° F.), and of storage in the laboratory in air-dry condition. The latter treatment resulted in a decrease in the active silt and an increase in the so-called passive silt, which is apparently of little or no significance. However, the active silt of black soil underwent practically no decomposition during two years of such storage.

New methods of chemical and mechanical analyses of soils are outlined which are based on these properties of the colloidal portions. In this connection different soils and the various strata thereof were found to have different coefficients of saturation for calcium, which are considered to indicate the varying conditions governing their origin. The loess soils of southern Russia, for instance, were found to have a low coefficient.

Saturation as a criterion for equilibrium between soil colloids and the most important form of absorbed calcium was found to yield a method for determining the lime requirement of soils, which is based on absorptive power and s determined by means of the absorption of ammonia and the degree of saturaion with calcium..

Plasticity of soils [trans. title], M. A. Antonova (*Pochvovedenie (Pédoogie), n. ser., 19 (1924), No. 1-2, pp. 7-35, figs. 2; Ger. abs., pp. 24-35*).—Studies conducted at the Institute of Experimental Agriculture of Leningrad on he plasticity of certain soils are reported.

Meadow soils containing salts showed the highest plasticities, followed in rder by the humus chernozem soils, medium humus, and loamy chernozem oils, and sandy loam and podsol soils. The greatest plasticity values were iven by the humus strata containing salt accumulations and the smallest in he podsol strata of soils.

Humus up to a certain limiting content was found to be a binding agent and) increase the plasticity of soils. Beyond this limit it had an opposite effect. ine grained soils containing a large percentage of silt gave high plasticity alues, while coarse grained soils gave low plasticity values. The plasticity of ay soils was reduced by admixtures of sand or calcium carbonate. The addion of talc increased the water holding power of soils and decreased their hesive power.

It is concluded that in general the plasticity limits of soils can serve as good dications of those properties which influence their tillage.

The moisture of the podsol in freezing and thawing in the year 923–24 [trans. title], F. V. Chibikov and A. Maliugin (*Nauch. Agron. ur. (Jour. Landw. Wiss.), 3 (1926), No. 1, pp. 40-51, figs. 3; Eng. abs., p. 50*).—udies conducted at the Agricultural Institute at Kazan are reported, the rpose of which was to explain the process of the movement of water in soil the fall and in the spring. The observations of soil moisture in the field the fall were made on plowed and unplowed soils. A movement of water om lower strata to higher strata was observed during the freezing of the l. This was distinctly evident both on plowed and unplowed soils in the l. A dry stratum occurred under the moist surface strata. The movement water from one stratum to another during freezing of soil was found to ceed in the form of a vapor. Moisture movement took place more energically in plowed than in unplowed soil. A stubble soil held snow better n a soil plowed in the fall. There was a relatively greater drying of the face soil of a plowed field during freezing. During thawing condensed l snow water accumulated in the surface soils was pressed out, so that fall wing was without result in moisture accumulation.

Soil moisture experiments at the Dominion Experimental Station, Swift Current, Sask., S. BARNES (*West. Canad. Soc. Agron. Proc., 5 (1924), pp. 14–19, figs. 2*).—Controlled experiments on soil moisture in two sets of tanks, the soil in one set being fallowed and that in the other cropped to wheat, indicated that wheat on the stubble tanks reached the limit of available moisture by July 4, while that on summer fallow was able to hold out two weeks longer before reaching the same point. There was a loss by evaporation of 58.7 per cent of the moisture from the fallow tanks, and an estimated loss of about 30 per cent on cropped tanks.

Report of certain investigations on the central Nebraska supplemental irrigation project, W. W. BURR and J. C. RUSSEL (*Nebr. Dept. Pub. Works Bien. Rpt., 15 (1923–24), pp. 198–240, figs. 11*).—A survey conducted by the University of Nebraska on the soils of the central Nebraska supplemental irrigation project and on the feasibility of irrigation in this area is presented.

The determination of available phosphoric acid of calcareous soils, S. DAS (*India Dept. Agr. Mem., Chem. Ser., 8 (1926), No. 6, pp. 69–104, figs. 6*).—This study is in three parts. Part 1 demonstrates the inapplicability of Dyer's method for determining the available phosphoric acid of calcareous soils. Part 2 deals with the extraction of phosphoric acid of calcareous soils with salt solutions. Part 3 reports experiments which indicate that a 1 per cent solution of potassium carbonate is capable of differentiating between fertilized and unfertilized soils of known cropping and manurial history, and thus gives an indication of the probable fertility of calcareous soils with reference to available phosphoric acid.

Origin of alkali soils [trans. title], D. G. VILENSKIĬ (D. C. WILENSKY) (*Pochvovedenie (Pédologie), n. ser., 19 (1924), No. 1–2, pp. 36–58; Ger. abs., pp. 56–58*).—Studies are reported in which the extensive saline soils of Eurasia are grouped as (1) salt soils which contain large amounts of easily soluble salts and (2) alkali soils which contain practically no soluble salts in their upper strata but show very poor physical properties, as indicated by the occurrence of almost impervious layers at shallow depths.

The structure of these impervious layers of soil may be prismatic or in the shape of narrow or broad columns. The prismatic structure occurs in the desert steppes, the narrow column structure in the dry steppes, and the broad column structure in the black soil steppes.

The prismatic and narrow column structures contain significant amounts of sodium chloride and sodium sulfate, and the broad column structure contains sodium carbonate.

The conclusion is drawn that alkali soils originate from salt soils.

Influence of microorganisms on the absorption of nutritive elements from soil [trans. title], J. STOKLASA (*Bul. Assoc. Chim. Sucr. et Distill., 42 (1925), No. 9, pp. 350–357; abs. in Jour. Soc. Chem. Indus., 44 (1925), No. 26, p. B465*).—In a contribution from the Experimental Station of the Republic of Czechoslovakia, a comparison of the soils of plats on which various crops were grown continuously is reported which showed, after four years, great differences in the numbers of bacteria present and in the amount of carbon dioxide respired per unit weight of soil. An alfalfa plat yielded the highest figures, followed in order by sugar beet and wheat plats. All cultivated soils gave much higher figures than uncultivated soils.

The differences in bacterial activity were reflected in the corresponding amounts of phosphoric acid and potassium taken up by the different crops from soil. Selective absorption of anions and cations by plants and the nutritional significance of the varying numbers of bacteria around the roots of different species are also discussed.

Ammonification in red prairie soils, H. F. Murphy (*Jour. Amer. Soc. Agron., 18 (1926), No. 3, pp. 177–183*).—Studies conducted at the Oklahoma Experiment Station are reported which showed that the general tendency was toward an increase in ammonification from the use of either calcium oxide or calcium carbonate on very fine sandy loam and loam soils.

Manure as a rule did not increase ammonification to any extent beyond that produced by lime. In some cases manure seemed to have a depressing effect on ammonification. A heavy application of lime caused greater ammonia production than a light application. Calcium oxide was as a rule slightly more favorable toward ammonification than calcium carbonate.

Sunlight and chemical nitrification [trans. title], I. P. Zholtsinskiĭ (J. Zolcinski) (*Pochvovedenie (Pédologie), n. ser., 19 (1924), No. 1–2, pp. 80–97; Ger. abs., pp. 95–97*).—Studies are reported which showed that nitrification took place in an aqueous ammonia solution of humus material under the influence of sunlight. No nitrification occurred when the sunlight was excluded, and the nitrates which were formed under the influence of sunlight disappeared with its exclusion. These reactions occurred during a relatively short period of time.

The humus solutions were found to bleach out gradually during this process, especially those artificially prepared. Nitrification proceeded more rapidly and was completed sooner in a quartz glass beaker than in a crock. This is attributed to greater action of the ultra-violet rays in the former.

Nitrification proceeded more slowly in natural humus solutions than in artificial solutions. The presence of aluminum hydrate in the solution accelerated the process. Attempts to produce chemical nitrification in solutions of other organic colloids, such as starch and gum Arabic, by means of sunlight were unsuccessful. The importance of studies to differentiate between the chemical and biological factors in soil nitrification is emphasized.

Effect on nodulation of supplementing the legume bacteria of the soil with artificial cultures, J. K. Wilson (*Jour. Amer. Soc. Agron., 18 (1926), No. 3, pp. 280–294*).—Studies conducted at the New York Cornell Experiment Station are reported in which soil samples from plats whose crop and fertilizer treatment for 15 years were known were used as a medium in which nodule production could be determined. Host plants of four groups of legume bacteria were grown and the nodules counted.

It was found that soils may be or may become an unfavorable habitat for the various groups of legume bacteria, that the bacteria may largely or entirely disappear from soil, that this disappearance accompanies increasing acidity of the soil, that the bacteria do not seem to be greatly influenced by the frequency of the host plant in the rotation, and that in acid soils the addition of more bacteria has resulted in the formation of a larger number of nodules per plant.

The decomposition of toxins by soil organisms, W. A. Gardner (*Alabama Sta. Bul. 225 (1926), pp. 38*).—Studies are reported which showed that the addition of calcium sulfate improves Robbins' solution for the growth of soil organisms. Solutions but slightly acid to phenolphthalein yielded the most abundant growth of a majority of soil organisms.

Seven toxins were added to the list of those decomposed by soil organisms, namely, resorcinol, cinnamic acid, quinone, hydroquinone, caffeine, piperidine, and benzidine. Organisms decomposing vanillin, cumarin, and resorcinol were found to be very common and widely distributed. Cinnamic acid, caffeine, and quinone were decomposed by the organisms of about two-thirds of the widely distributed soils tested, while hydroquinone was decomposed by only one-third of them.

About three-fourths of the soils from several States contained organisms able to decompose pyridine and piperidine. A few soils contained organisms decomposing benzidine. In their order organisms decomposing quinone, hydroquinone, caffeine, pyridine, piperidine, and benzidine were found to occur in a decreasing number of States.

Effect of the application of mineral fertilizers upon soil reaction [trans. title], P. I. ANDRIANOV (P. J. ANDRIANOW) (*Nauch. Agron. Zhur.* (*Jour. Landw. Wiss.*), *3* (*1926*), *No. 1, pp. 30–39; Eng. abs., p. 39*).—Studies conducted at the Moscow Agricultural Academy to determine the effect of ammonium sulfate, calcium carbonate, sodium nitrate, phosphate rock, Stassfurt potash salt, and acid phosphate upon the reaction of uncropped soils are reported.

Calcium carbonate increased pH values and ammonium sulfate decreased them, sodium nitrate produced a slight increase and acid phosphate a slight decrease, and phosphate rock and Stassfurt potash salt had no influence. Drying of soil during 24 hours at a temperature of from 80 to 100° C. (176 to 212° F.) decreased the pH values in all cases, and especially when fertilized with ammonium sulfate. There was a marked increase in pH values as a result of leaching.

[Cottonseed meal as a fertilizer] (*Texas Sta. Bul. 341* (*1926*), *pp. 24–27*).—Practical information on the relation of cottonseed meal to diversified farming, and its use as a fertilizer is briefly presented.

Investigations on fish meals, I, II, W. L. DAVIES (*Jour. Soc. Chem. Indus.*, *44* (*1925*), *No. 42, pp. 487T–491T; 45* (*1926*), *No. 5, pp. 25T–29T*).—Two contributions from the University College, Reading, on fish meals are presented.

I. *The nature of the water-soluble nitrogen compounds.*—Studies are reported of five different kinds of fish meals, indicating that fish meals of present-day commerce are greatly changed, both in the nature and the amount of their soluble nitrogenous compounds, owing to the various treatments which they have undergone. Creatine, xanthine, and related compounds have been either leached out or completely decomposed. Other nitrogen compounds have been leached out to different degrees, and some protein has been broken down to different stages of degradation. Gelatin-producing compounds have been hydrolyzed to different degrees.

The water-soluble nitrogen fractions of yellow and white fish meals were found to differ appreciably. The amount of the simpler degradation products of proteins is larger in the former, whereas the latter contain more of the higher protein fission products. This is attributed to prolonged drastic treatments such as steaming, drying, and grinding. It was found that from one-fifth to two-fifths of the nitrogen in the meals can be extracted by water.

A determination of the diamino acid content of two of the extracts showed that on the average the compositions of the extracts compare favorably with the composition of some protein hydrolysates. Various alcoholic extracts from two typical classes of meals were found to differ especially in the percentage of nitrogen extractable by hot alcohol and in their composition. A great variation was found in the amount of volatile bases in the extracts, but the ammonia content was fairly constant. A determination of the volatile fatty acids in the extracts showed that more decomposition of both fat and amino acids has occurred in the yellow meals. The amount of nonvolatile acids is fairly constant throughout.

II. *Changes occurring in the water-soluble nitrogen and in the amount of water-soluble phosphorus with different methods of treatment and storage.*—Samples of the five types of meal were stored in bags, in open vessels, and in a dry warm state for seven months. They were also stored in a cold and in a warm wet state for three weeks.

The short wet treatments increased the acidity as did also the mold growth in the long period storages. The short wet treatments generally were accompanied by increases in the water-soluble nitrogen. With long period storages the tendency was for the amount of water-soluble nitrogen to decrease. The short wet treatments caused the most breaking down. Warm dry treatment caused little change in the amount of water-soluble nitrogen. There was some decarboxylation of the soluble carbon compounds with cold wet storage, and during prolonged warm dry storage deamination of the water-soluble compounds of all meals occurred.

Wet treatment increased the amount of volatile base in the water-soluble fraction. A decrease in the amount of volatile base was observed with other treatments. No rule was found to govern the increase in the amount of soluble phosphorus with each treatment, and this amount bore no relation to the initial acidity. Warm dry treatment had the greatest effect, while other treatments caused only small changes. Mold growth caused a decrease in soluble phosphate, an increase in initial acidity, but no effect on the volatile base content of the aqueous extracts.

Wet treatments caused all the meals to become unwholesome. Dry treatment caused no fetid odor to be given off in spite of mold growth in some cases. Bag storage caused oily meals to become rancid in odor and some white meals to become unwholesome and fetid.

Comparative value of sulphate of ammonia and nitrate of soda, J. W. WHITE (*Barrett Co.* [*New York*] *Agr. Dept.* [*Pub.*] *23,* [*n. ser.*], *1925, pp. 12, figs. 5*).—The results of forty years' field tests at the Pennsylvania Experiment Station are briefly summarized, from which the conclusion is drawn that the relative value of ammonium sulfate and sodium nitrate as fertilizers is not indicated. However, they are thought to develop clearly the improper use of ammonium sulfate.

Potash: Significance of foreign control and economic need of domestic development, H. M. HOAR and C. C. CONCANNON (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Prom. Ser. 33* (*1926*), *pp. IV+92, figs. 10*).—A general survey of the potash situation is presented for the purpose of directing the attention of the American potash consumers to the domestic and foreign status of this industry. Foreign sources of potash, their political and commercial control, with monopolistic and price raising tendencies, production, consumption, and trade are outlined for the better visualization of United States requirements for this product.

Can the lime-requirements of the soil be determined from the reaction of soil suspensions containing potassium chloride? M. TRÉNEL (*Internatl. Rev. Sci. and Pract. Agr.* [*Rome*], *n. ser., 3* (*1925*), *No. 4, pp. 1011–1017, fig. 1*).—In a contribution from the Geological Institute, Berlin, an attempt is made to determine the lime requirement of soil from the pH value of the soil suspension in M/10 potassium chloride solution. The dependence of the lime requirement on the pH is graphically represented. The curve of the humus soils is clearly distinguishable from that of the pure mineral soils, and indicates a lower lime requirement.

Lime for West Virginia farms, D. R. DODD (*West Virginia Sta. Bul. 215* (*1926*), *pp. 24, figs. 16*).—Practical information on the use of lime on West Virginia farms is presented, including a description of a homemade lime spreader, lime pulverization, and lime burning. Working drawings for a lime kiln are included.

Gypsum in 1924, K. W. COTTRELL (*U. S. Dept. Com., Bur. Mines, Min. Resources U. S., 1924, pt. 2, pp. II+231–240*).—Data on the production and use of gypsum during 1924 are presented. The total quantity of gypsum mined

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in the United States in 1924 was 5,042,629 short tons, or an increase of 6 per cent over 1923.

AGRICULTURAL BOTANY

Further observations on nonsymbiotic germination of orchid seeds, L. KNUDSON (*Bot. Gaz., 77 (1924), No. 2, pp. 212–219, figs. 3*).—These experiments, so far as completed, lend further support (E. S. R., 48, p. 223) to the view that germination in orchid seeds requires an outside source of organic matter. Sugar in germination acts as a food; but after the leaf has appeared growth may continue without available organic matter in the medium. Though the embryos possess chlorophyll, photosynthesis is absent, presumably owing to the lack of some internal factor. These experiments, though they do not disprove the indispensability of the fungus to germination under certain conditions, emphasize the nutritional aspects of the problem.

Physiological study of the symbiotic germination of orchid seeds, L. KNUDSON (*Bot. Gaz., 79 (1925), No. 4, pp. 345–379*).—Previous papers (see above) have shown the necessity to germination of available organic matter, emphasizing the nutritional aspects of the problem and presenting also views regarding the possible function of the fungus in certain pure culture experimentation to which reference is made. The experimentation here detailed deals with the relation of the endophytic fungi to germination.

A fungus resembling morphologically that described as *Rhizoctonia repens* was isolated from Cattleya, Cypripedium, and Epipactis. This fungus was capable of inducing seeds of Cattleya to germinate on a medium containing starch, also of accelerating growth of orchid seeds in a solution containing sucrose. It may permit complete germination or may cause complete failure to germinate, one of the factors controlling the degree of infection being the concentration of starch (ultimately, of sugar) used. During the change, digestion of starch and production of sugar, the H-ion concentration is changed from a value unfavorable to one favorable to growth, these external changes being sufficient to bring about germination, which may be effected by the fungus even when no seeds are infected. *Phytophthora* sp. is about as favorable to germination as the orchid fungus, the chemical changes being nearly the same as those produced by the orchid fungus. Other fungi were found effective in this regard.

In determining the effect of the fungi isolated from Cattleya, Epipactis, and Cypripedium on seeds of Odontoglossum it was found that these fungi are extremely pathogenic, practically every seed being killed. Without the fungus the seeds turned green and were still living six months later. When sugar was supplied the seeds germinated.

Divergence of catalase and respiration in germination, L. E. RHINE (*Bot. Gaz., 78 (1924), No. 1, pp. 46–67, figs. 4*).—In six kinds of seed tested, catalase showed a decrease in early germination stages, followed by an increase. Catalase decreased slowly almost to exhaustion in prolonged soaking of seeds in oxygen-free water. A simple respirometer is described as usable with large quantities of material. Catalase in ripening seeds decreased per unit both of wet and of dry weight. It increased per ovule as the seed grew, but after the ripening process began it decreased rapidly with decrease of water content. The production of catalase is indirectly connected with oxidation. Catalase could be used as an indicator of metabolism only in cases where there was no rapid change in respiration.

Effect of size of seed on plant production with special reference to radish, N. A. ROTUNNO (*Bot. Gaz., 78 (1924), No. 4, pp. 397–413, figs. 4*).—No

definite statement is made as to which radish seed size produces the largest root. From the data herein recorded it appears that the results obtained with one variety are not necessarily comparable with the results from another variety.

Protein synthesis by plants.—I, Nitrate reduction, S. H. ECKERSON (*Bot. Gaz., 77 (1924), No. 4, pp. 377–390*).—The phases considered in this study of protein synthesis are reduction of nitrates, synthesis of amino acids, and linkage of amino acids. This paper deals with the first of these phases.

Reduction of nitrates to nitrites and ammonia, as obtained by tomato plant extract in slightly alkaline solution in the presence of fructose or glucose and some free oxygen in darkness as well as in light, was found to be most active in solutions having a pH value of approximately 7.6. Expressed juice of nitrogen-high tomato plants containing also abundant sugar, after adding N/10 NaOH to produce a pH value of 7.6, gave very rapid reduction of nitrates to nitrites at 50° C. (122° F.) Tomato plant juice boiled and brought to pH 7.6 reduced nitrates as rapidly as did the unheated juice. The rate and amount of reduction of nitrates to nitrites by tomato plant extract were found to be the same in darkness as in light.

"Amino acids (newly synthesized) appeared at the nodes and in petioles and blades of young leaves and just behind the stem tips of carbohydrate-high tomato plants three or four days after nitrate had been supplied to the soil. The amino acids were aspartic acid, asparagine, alanine, leucine, cystine, and histidine."

Quantitative relations of carbohydrates to nitrogen in determining growth responses in tomato cuttings, M. E. REID (*Bot. Gaz., 77 (1924), No. 4, pp. 404–418, figs. 8*).—The investigations here noted are the outcome of studies stimulated by the observations of Kraus and Kraybill (E. S. R., 40, p. 40).

It appears that growth responses as expressed in root and shoot production may be determined at least in part by the nature of the available food materials. A high nitrogen supply plus a readily available (even if limited) carbohydrate supply appears to furnish favorable conditions for shoot growth. A somewhat limited nitrogen supply plus a readily available supply of carbohydrates appears to furnish favorable conditions for root growth. Apparently there is a greater utilization of the carbohydrate reserves in carbohydrate-high cuttings grown in light than in those grown in darkness, and the utilization is greater in the cuttings grown in the solution plus nitrates than in those grown in a solution minus nitrates. A synthesis of nitrogenous materials usable in growth probably occurs in cuttings grown either in light or in darkness, but such synthesis appears to be greater in amount in light than in darkness. Light appears particularly favorable to the growth of shoots.

"The cuttings have a tendency to do what the plant has been doing. If the plant was producing shoots abundantly and roots to a relatively small extent, the basal cutting from such a plant tends to produce a few roots and some shoots, and the top cutting chiefly shoots, the combined effect being a greater total tendency toward shoot production. If the plant was producing roots abundantly and shoots to a small extent, the basal cutting tends to produce only roots, the top cutting to produce roots and some shoots, the combined effect being a greater total tendency toward root production."

Factors governing seasonal changes in transpiration of Encelia farinosa, E. B. SHREVE (*Bot. Gaz., 77 (1924), No. 4, pp. 432–439*).—This investigation was undertaken to discover, if possible, the mechanism of reduction in relative transpiration found in the previous study (E. S. R., 51, p. 822) to occur in *E. farinosa* under conditions of increasing acidity.

The difference in the anatomical structure of the mesophytic and xerophytic leaves does not account for the greater resistance to water loss in the arid season.

When disks of equal areas are cut from the two types of leaves immediately before sunrise and placed under identical external conditions, the water loss from them is found to vary inversely with the total imbibitional capacity and directly with the original water content. The total imbibitional capacity of both types of leaves varies with the original water content and the dry weight. The lower the original water content, the greater the amount of soluble material diffusing into the water which surrounds imbibing disks. The dry weights after imbibition have one constant value for mesophytic and another for xerophytic leaves. The ratio of evaporation to soil moisture affects the water content of leaf tissue, which in its turn affects the imbibitional capacity and resistance to water loss of leaf tissue. The changes in imbibitional capacity are accompanied by changes in the amount of soluble material in the tissue. These changes in diffusible material are supposed to be the resultants of reversible chemical changes which take up or give up water according to the amount available.

The range of toleration of hydrogen-ion concentration exhibited by Fusarium tracheiphilum in culture, A. J. Mix and D. L. Vaughn (*Abs. in Phytopathology, 14 (1924), No. 1, p. 63*).—Cultures of a strain of *F. tracheiphilum* from cowpea grew on agar at all concentrations tried between pH 2.6 and pH 11.8 and on potato dextrose broth between pH 2.96 and pH 11.42. These wide ranges are considered interesting when the specialized nature of the parasite is considered.

Cytological and physiological changes in Vicia faba irradiated with Röntgen rays, H. Komuro (*Bot. Gaz., 77 (1924), No. 4, pp. 446–452, fig. 1*).—Continuing earlier work (E. S. R., 54, p. 626), this contribution follows up the preliminary note on the cytological experiments of 1922, and gives results of observations on physiological aspects of experiments of 1923. Methods are to be detailed later.

Both cytological and physiological observations are briefly indicated. The degenerative cytological change previously noted as quickly following exposure to Röntgen rays was found to begin as early as 1.5 hours after irradiation, and within 9 hours after exposure various stages of degeneration were observable. These resembled the conditions previously described, closely approximating those noted by the author, as well as by others, in tumor cells. Intermittent use of X-rays may be summed up to harmful doses by repeated exposure. The inferred bearing of these experiments on the therapeutic employment of X-rays is briefly discussed.

Preliminary study of rôle of salts in pollen tube growth, R. A. Brink (*Bot. Gaz., 78 (1924), No. 4, pp. 361–377*).—"The most striking feature of these results is the extreme sensitiveness shown by pollen tubes to salts."

The phenomena of antagonism between salts in relation to bacteria [trans. title], E. Mishustin (Mischustin) (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 1 (1924), No. 4, pp. 274–284; Ger. abs., p. 284*).—A study of the behavior of univalent and bivalent salts in connection with the development of bacterial cells has shown that the concentration of a salt, requisite to cause an inhibitory action on the development of an organism, depends wholly upon the properties of the components, as cation or anion in case of each salt. Osmotic pressure is not significant in this connection, the specific toxicity of the salt being the determining factor. The phenomena of antagonism of salts as between univalent and polyvalent metals vary with different bacteria analogously with the corresponding phenomena among more highly organized plants.

The measure of nontoxic antagonistic action of salts depends upon the concentration of the toxic salts. The phenomena of antagonism appear to be conditioned by the influence of the undissociated molecule. The greatest protection is afforded by such systems as those in which the anion of the antagonistic salts agrees with the anion of the poisonous salt, where dissociation of the antagonists is minimized.

Clogging of stomata of conifers in relation to smoke injury and distribution, J. B. Rhine (*Bot. Gaz., 78 (1924), No. 2, pp. 226–232*).—The black deposit in the stomatal pits of certain conifers, thought to be soot, was found to be a natural product of the leaf. The substance in the stomata of fir, juniper, and Austrian pine proved to be a wax, finely granular. Though permeable to gases, it is thought to retard gas exchange, metabolism, and water loss. A remarkable parallel is evident between presence of this wax and xerophytism in the conifers, and between absence of this wax and mesophytism, as well as hygrophytism. No relation was found between wax in the stomata and the high sensitiveness of certain conifers to smoke, except that as a factor inducing xerophytism the wax may lower the resistance of the tree.

Crop injury resulting from magnesium oxide dust, F. J. Sievers (*Phytopathology, 14 (1924), No. 2, pp. 108–113, fig. 1*).—The injury to crops from a deposit of magnesium oxide from a magnesite plant in eastern Washington is described. It is shown that magnesium, when present in soils beyond certain amounts, produced injurious effects on oats, but that the normal soil in the valley in localities where it is outside the zone of influence from the calcining plant did not carry enough magnesium or alkali salts to cause injury to crops.

Wound healing of mesophytic leaves, R. B. Wylie (*Abs. in Phytopathology, 14 (1924), No. 1, pp. 53, 54*).—A brief description is given of the method by which leaves repair damage done to them. The author believes that the temporary and permanent cicatrices formed protect leaves from the entrance of fungi.

GENETICS

Recent results relating to chromosomes and genetics, T. H. Morgan (*Quart. Rev. Biol., 1 (1926), No. 2, pp. 186–211, figs. 16*).—This paper presents an analysis of the more recent experiments bearing on polyploidy, sex chromosomes in dioecious plants, and the genetic factors carried in the Y chromosome.

Chromosome morphology in Fritillaria, Alstroemeria, Silphium, and other genera, W. R. Taylor (*Amer. Jour. Bot., 13 (1926), No. 3, pp. 179–193, figs. 60*).—Following a general review of the phenomena of satellites and of chromosome constrictions, the author reports upon cytological studies of root tip cells in several species, *Fritillaria imperialis, Alstroemeria braziliensis, Silphium perfoliatum, Allium cepa, Bryophyllum calycinum, Freesia refracta,* and *Ricinus communis.*

Cytological studies in the Cucurbitaceae.—I, Microsporogenesis in Cucurbita maxima, E. F. Castetter (*Amer. Jour. Bot., 13 (1926), No. 1, pp. 1–10, pls. 2*).—Using as a source of material young blossoms of a pure line of Hubbard squash developed by the Vermont Experiment Station (E. S. R., 46, p. 138), the author found that quadripartition of the pollen mother cell is effected by partition walls which originate on the inner surface of the special wall which is formed just inside the original mother cell wall. Definite but transitory cell plates were observed on the heterotypic and homoeotypic spindles, but these take no part whatever in the division of the pollen mother cell. The haploid number of chromosomes is 20.

Genetical and cytological studies of the origin of false wild oats, C. L. Huskins (*Sci. Agr., 6 (1926), No. 9, pp. 303–313, figs. 40*).—Continued investi-

gations at the University of Alberta on the origin of false wild oats (*Avena sativa* mut. *fatuoida*) (E. S. R., 54, p. 442) are reported on, and the general trend of the work is pointed out, reference also being made to recent work of others.

Significant cytological irregularities were found in the reduction divisions of the pollen mother cells of fatuoid oats. In the three strains of homozygous fatuoids so far investigated the normal number (42) of univalent chromosomes appears to be present in all cells at diakinesis, but instead of these forming 21 pairs as in the normal *A. sativa*, abnormal groups of three or four united chromosomes are often seen in a high proportion of cells in the heterotypic division. Faintly staining masses, apparently chromosomes undergoing decomposition, are occasionally observed in the cytoplasm during the homotypic division. Much of the pollen is abortive. Similar but more frequent irregularities were observed in one strain of heterozygous fatuoids and its segregates. The following chromosome numbers have been found in Avena: *A. sativa*, *A. fatua*, *A. nuda*, *A. sterilis*, and *A. ludoviciana* 21 (42); *A. barbata* 14 (28); and *A. brevis*, *A. strigosa*, and *A. wiestii* 7 (14).

All homozygous fatuoids and normal segregates from heterozygous fatuoids have been found to breed true. Homozygous fatuoids, heterozygous fatuoids, and normal segregates in the rato of 64 : 153 : 76 were obtained from a heterozygous fatuoid of Banner oats. The F_1 of reciprocal crosses between normal Banner and homozygous fatuoid Banner were indistinguishable from ordinary heterozygous Banner fatuoids, and gave similar progenies and ratios in F_2. Statistical studies on the number of culms and height of the three classes of segregates from the heterozygous Banner fatuoid and from homozygous fatuoid×Banner showed no significant differences in the means of the three forms. However, there seems to be a greater degree of variability among the homozygous fatuoid segregates. The author considers that the evidence is overwhelmingly against the theory that fatuoids arise by natural crossing. "They differ from normal oats by either a single factor or a group of factors very closely linked, probably the latter, and are considered to be true mutations. The cytological observations indicate that some chromosomal aberration rather than a change in a single gene is instrumental in causing their appearance. The genetic facts could also best be explained on the basis of a regional change or whole chromosome difference."

Cytological studies in Trifolium [trans. title], G. D. KARPECHENKO (KARPETSCHENKO) (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant-Breeding), 14 (1924–25), No. 1, pp. 271–279, figs. 29; Ger. abs., p. 279*).—The diploid chromosome numbers in 24 species of Trifolium are listed.

Genetic-physiological analysis of heterostyly [trans. title], G. VON UBISCH (In *Bibliographia Genetica. The Hague: Martinus Nijhoff, 1925, vol. 2, pp. 287–349, figs. 21*).—An extensive review of studies on the genetics of heterostyly in Primula, Fagopyrum, Forsythia, Linum, Lythrum, Oxalis, etc., is presented, with discussion of physiological and environmental factors involved. The bibliography includes 81 titles.

A preliminary note on reversed badger-face pattern in sheep, J. A. F. ROBERTS and T. J. JENKIN (*Welsh Jour. Agr., 2 (1926), pp. 70–73, pl. 1*).—In a previous report (E. S. R., 53, p. 228) the badger-face pattern in sheep was found to be inherited as a simple recessive factor, although considerable variation was also apparent. In the present paper, three ewes are described which possessed the reversed badger-face pattern. The limited data available indicate that this characteristic is inherited as a simple recessive to white, and that it is independent of the badger-face pattern and of black color.

Intelligence as a Mendelian character, H. R. Hunt (*Jour. Heredity, 17 (1926), No. 2, pp. 53–58*).—The author discusses the inheritance of intelligence from data from various sources, from which it is assumed that the multiple factor hypothesis offers the best explanation of the mode of inheritance. The theoretical offspring expected from matings of different genotypes on the assumption that five pairs of factors are responsible are tabulated. It is concluded that this theoretical explanation fits the available data quite accurately.

The evolution of the horse: A record and its interpretation, W. D. Matthew (*Quart. Rev. Biol., 1 (1926), No. 2, pp. 139–185, pl. 1, figs. 27*).—An account is given of the evolution of the horse, based largely on a study of the series of fossils in the American Museum of Natural History. The steps in the evolution of the teeth and feet are particularly complete, and an effort is made to interpret the meaning of the changes in these parts.

The relation of inheritance studies to corn improvement, A. M. Brunson (*Jour. Amer. Soc. Agron., 18 (1926), No. 4, pp. 308–314, fig. 1*).—The findings to date in genetic research with corn are evaluated from a practical viewpoint.

Inheritance of carbohydrates and fat in corn, E. W. Lindstrom and F. Gerhardt (*Abs. in Iowa Acad. Sci. Proc., 31 (1924), p. 133*).—Chemical analyses of hybrid ears involving Iodent (yellow dent) and Evergreen (white sweet corn) varieties have shown that high sugar and dextrin (also low starch) are distinctly recessive in inheritance, although there is a small cumulative effect of the genetic factors represented in the endosperm development with its $3x$ condition. No such cumulative effect is present with respect to fat, the hybrids (reciprocal) being identical in value and intermediate in percentage but with a slight tendency toward a dominance of low fat. Carbohydrate and fat values are interrelated genetically, but this probably indicates a morphological relation within the kernel.

Genetic relation of endosperm and chlorophyll characters in maize, W. A. Carver (*Iowa Acad. Sci. Proc., 31 (1924), p. 129*).—In a study of the interrelation of sugary endosperm, virescent, and brindled (a chlorophyll defect in corn), brindled was found to be a simple Mendelian recessive to normal green and independent of virescent in inheritance. The double recessive condition of the factors for virescent and brindled produces an albino plant. The brindled character and sugary endosperm showed a linkage (in the repulsion phase) with 26.3 per cent of crossing over.

Notes on grasses [corn], P. Weatherwax (*Ind. Acad. Sci. Proc., 40 (1924), pp. 227, 228*).—Preliminary reports are made on two investigations with corn at Indiana University.

Carpellody in maize.—A type of imperfect grain resembling defective kernels inherited as recessive seed characters is inherited as a recessive plant character, may occur in few or many of the spikelets of the ear, and is indicated as a case of carpellody. One, two, or all three of the rudimentary stamens in the functional pistillate flower are metamorphosed into the semblance of pistils. The style and stigma of these resemble those of the normal pistil, but the ovarian portion has neither true ovarian cavity nor ovule.

Many-flowered spikelets in maize.—A supposedly hereditary variation was found in which some spikelets of the corn tassel have assumed the indeterminate form, the lower flower being more advanced in development and the number of flowers increased to three or more. This is accompanied by a change in sex, the pistils instead of the stamens being functional.

Fasciated kernels, reversed kernels, and related abnormalities in maize, T. A. Kiesselbach (*Amer. Jour. Bot., 13 (1926), No. 1, pp. 35–39, pls. 2*).—A systematic search at the Nebraska Experiment Station disclosed that fasciated

or fused kernels occur rather frequently, being found in the 38 varieties, inbred pure lines, and crosses listed. In an average run of corn about 1 kernel in 200,000 was fasciated, but in some varieties this abnormality was 20 times as frequent. Fused kernels, misplaced germs, and reversed kernels all occur most often near the tips of the ears. The degree of fusion in fasciated kernels varies greatly.

False polyembryony in maize, T. A. KIESSELBACH (*Amer. Jour. Bot., 13 (1926), No. 1, pp. 33, 34, pl. 1*).—Several cases of false polyembryony found during germination tests at the Nebraska Experiment Station are described and illustrated.

Some differences in the functioning of selfed lines of corn under varying nutritional conditions, G. N. HOFFER (*Jour. Amer. Soc. Agron., 18 (1926), No. 4, pp. 322–334, figs. 7*).—Experiments in progress at the Indiana Experiment Station in cooperation with the U. S. Department of Agriculture showed that the absorption abilities of selfed lines of corn and of crosses between them vary widely with respect to certain of the essential mineral nutrients and to the iron and aluminum salts in the soil solution. The quantities of certain ash constituents absorbed by the hybrids were intermediate between the amounts absorbed by the parent selfed lines, while the hybrids absorbed less iron and aluminum than either of the parent lines. Less iron and aluminum were absorbed by the hybrid in loam than in clay, the differences being inversely related to the increased growth. The absorption tendencies of the plants which resulted in the vigorous hybrid absorbing less of the two elements than either of the less vigorously growing parents seemed to be associated with heterosis. The heritable tendencies of certain selfed lines to have leaves develop "dying-between-the-veins" were apparently associated with a relatively higher percentage content of iron and aluminum in the dry matter of such leaves than in the normal leaves of each generation.

The comparative water economy of selfed lines of corn and their hybrids, T. A. KIESSELBACH (*Jour. Amer. Soc. Agron., 18 (1926), No. 4, pp. 335–344, figs. 3*).—Transpiration studies were conducted at the Nebraska Experiment Station, supplementary to field experiments, to indicate the relation of heterozygosity to the water economy of corn and to suggest the variability expected in this regard between different selfed lines and hybrids.

A definite relation apparently exists between heterozygosity and the water requirement of corn. Selfed lines reduced in size and productivity by inbreeding have higher water requirement ratios than either F_1 hybrids between them or than the original variety from which they were developed. F_2 hybrids also reduced in productivity have somewhat higher average water requirement ratios than the F_1 hybrids from which they are produced, although the effect is not so marked as with long-continued selfed lines. Considering water requirement ratios, no advantage accrues from having more than two selfed lines recombined into an F_1 hybrid. Double crosses and single crosses were about equally efficient in the use of water. The high efficiency of an F_1 hybrid involving eight selfed lines suggested that efficient synthetic varieties may also be produced. Different F_1 hybrids vary widely as to productivity, water requirement ratios, and total water transpired per plant.

Genetic linkage between chlorophyll and carotinoid pigments in maize, E. W. LINDSTROM (*Abs. in Iowa Acad. Sci. Proc., 31 (1924), p. 132*).—Genetic analysis of the inheritance of the pigments chlorophyll and carotin (and xanthophyll) in corn indicated that these pigment groups are controlled by different genetic factors. Most of the genes for chlorophyll development seem to be inherited independently of the yellow-producing gene, *l*. However, a

case of linkage involving this yellow factor and one of the three complementary genes responsible for chlorophyll development in the seedling stage of corn has been found. These two linked genes, w_2 and l, apparently belong with the *R-L-G* linkage group since they show typical linked inheritance with about 21 per cent of crossing over.

Cytological investigation of rye-wheat hybrids [trans. title], V. R. ZALENSKIĬ (ZALENSKY) and A. V. DOROSHENKO (*Trudy Prikl. Bot. i Selek.* (*Bul. Appl. Bot. and Plant Breeding*), *14* (*1924–25*), *No. 1*, *pp. 185–210*, *figs. 25*; *Eng. abs.*, *pp. 209, 210*).—Cytological studies on rye × wheat hybrids from the F_1 to F_6 generations revealed that the processes in the somatic cells of the F_1 and subsequent hybrids take place normally, the difference between these and pure forms being limited to chromosome number. Anomalies characteristic of hybrids, observed in meiosis in the pollen mother cells, were most pronounced in the F_1. Since F_1 pollen was not functional, pollination in this generation evidently took place from rye or wheat. F_2 and subsequent generations segregated into plants resembling (1) wheat, (2) rye, and (3) intermediates. The segregates resembling either parent were characterized by reestablishment of normal cytological processes and the return of normal fertility, whereas those in the intermediate group retained the anomalies in different degrees in the generations studied.

Pseudo-fertility in Nicotiana, F. F. SMITH (*Ann. Missouri Bot. Gard.*, *13* (*1926*), *No. 2*, *pp. 141–172*, *figs. 4*).—According to investigations at the Missouri Botanical Garden, in the *N. alata* × *N. forgetiana* hybrids, pseudo-fertility as defined by East and Park (E. S. R., 38, p. 823) is exhibited in both self- and cross-sterile combinations and is of the same order in both cases. In Nicotiana pseudo-fertility was not found of the same order as true fertility, whereas it stands in direct relation to true sterility. No seasonal change in the degree of expression of pseudo-fertility was observed. Bagging the panicle increased the degree of pseudo-fertility, but since the effect was constant throughout these investigations the conclusions were not influenced. Pseudo-fertility was not seen in any of the self- and cross-sterile pollinations on plants of *N. alata*. Pollen measurements indicated that a larger percentage of abnormal pollen exists in families arising from self pollinations than in cross bred strains.

Investigation of the factorial constitution of some complex heterozygotic Oenothera, O. RENNER (*Untersuchungen Über die Faktorielle Konstitution Einiger Komplexheterozygotischer Önotheren. Leipzig: Borntraeger Bros., 1925*, *pp.* [2]+*168*, *figs. 58*).—The studies reported dealt with the behavior of hybrids between different forms of Oenothera, segregation ratios, the factors isolated and their linkage relations, lethal factors, and pollen characteristics.

Renner's studies on the genetics of Oenothera, A. H. STURTEVANT (*Quart. Rev. Biol.*, *1* (*1926*), *No. 2*, *pp. 283–288*).—The present review endeavors to show how the studies by O. Renner in Germany on the peculiarities of the evening primrose (*Oenothera* sp.) aid in explaining the genetic behavior of Oenothera.

Parthenogenesis in the grouse locust, Paratettix texanus Hancock, R. K. NABOURS and M. E. FOSTER (*Abs. in Anat. Rec.*, *31* (*1925*), *No. 4*, *p. 358*).—Among 2,479 matings of *P. texanus*, 15 produced 82 offspring, which were, with one exception, females, showing exclusively segregate and crossover patterns of the female parents, with no trace of the contrasting dominant color patterns of the males. Eleven offspring successfully tested were found to be homozygous for dominant maternal patterns. Further experiments with parthenogenetical offspring showed that they were those that would be expected from noncrossover and crossover gametes of the parents. Thus

segregation and crossing over appear to occur in individuals producing parthenogenically to the same extent as those producing bisexually. Reproduction seems to occur in either way, but females are much more prolific when mated than when unmated.

Piebald (Spanish) sheep and their crosses with other breeds, J. A. F. Roberts (*Welsh Jour. Agr., 2 (1926), pp. 66–69, pls. 2*).—Crosses of various breeds of sheep with Piebald ewes and rams were found to give all black offspring except for a few with white spots on the top of the head and tip of the tail. When an F_1 ram resulting from the cross Piebald × Southdown was mated with Welch mountain ewes 6 white and 5 black lambs were produced, which indicated that the Piebald sheep possess a dominant factor for black. These sheep also appear to be homozygous for a recessive factor for spotting, but this has not been completely established.

Non-inheritance of the temperature effect on bar eye in Drosophila melanogaster, C. Zeleny (*Abs. in Anat. Rec., 31 (1925), No. 4, pp. 356, 357*).—Since it has been demonstrated that the number of facets in bar-eyed Drosophila is affected by the temperature at which the larvae develop, tests were made to determine whether differences in hereditary constitution could be produced by continued subjection to different temperatures. The facet number of one group of individuals produced by inbreeding from a single pair of flies and allowed to develop at 17° C. was approximately two and one-half times that of the second group descending from the same individuals but kept at 27°. Transfers of the one line to the temperature of the other have been made in four tests, one after 64 generations, but so far no germinal changes have appeared which can be ascribed to the temperature effect.

Effects of ten generations of alcoholism upon albino rats, F. B. Hanson (*Abs. in Anat. Rec., 31 (1925), No. 4, p. 357*).—Data are reported on control rats and rats treated with alcoholic fumes through 10 generations of brother and sister mating. All the individuals from both groups descended from a single pair of parents. In 4 of the 10 generations, the mean birth weight of the treated individuals was greater than that of the controls but not significantly greater. In the other generations the birth weight of the treated rats was lower than that of the controls, and in some cases this difference appeared to be significant. The experimental animals produced larger litters than controls in every generation except the first, and in some generations this difference was significant. The size of litter and birth weight were negatively correlated. At 20 days of age the treated animals were equal in weight to the controls, but after this age the treatment which began at that time tended to slow the growth rate. The grandchildren of the tenth treated generation showed no greater resistance to the alcoholic fumes than the corresponding control generation.

Alcohol and the sex ratio, F. Heys (*Abs. in Anat. Rec., 31 (1925), No. 4, pp. 357, 358*).—Data on the 10 generations of inbreeding for the 3,123 treated and control animals used in the above experiment showed that in 9 of the 10 generations there was no significant difference in sex ratio between the treated and control stocks. The combined results indicated that severe and prolonged administration of alcoholic fumes did not have a significant effect upon the sex ratio.

The physiological factors governing the proportions of the sexes in man, A. S. Parkes (*Eugenics Rev., 17 (1926), No. 4, pp. 275–293, fig. 1*).—Data from various sources are presented which show the sex ratio of man at birth and for abortions at various ages, from which it is concluded that there is a large percentage of males at conception and that this percentage is reduced differently in different races by a differential mortality of the two sexes during gestation.

On the phenomena of sex transition in Arisaema japonica Bl., T. MAEKAWA (*Jour. Col. Agr., Hokkaido Imp. Univ., 13 (1924), No. 3, pp. 217–305, pl. 1, figs. 9*).—Among the four species of Arisaema known to grow wild in the forests of Hokkaido, *A. japonica* has the widest distribution, and with 231 corms of this plant the author experimented from 1917 to 1922. He has been able to show that this species undergoes some conspicuous sex transformations in a very regular way. Transformation of sex does not ordinarily occur at random but in a definite manner from year to year. The process commences in its asexual state and proceeds through the male to the female state in which the plant is said to thrive for years. Sometimes the order in which sex transformation takes place is reversed, although this retro-transition of sex is limited to certain conditions, tending to revert to a normal course on reversal or removal of the disturbing conditions.

This plant, or its parts, may present aspects characterizing it as male, female, or asexual. The sexual expressions of this plant are not fixed characters. A relation of corm weight to sex reversion is noted. Sex in corms was successfully controlled by cutting away certain portions. The author believes that sex in this plant is determined by the quantity of the formative assimilation products; that is, by the assimilation products in the fresh form before they are stored in the reserve organ. The corm weight can, it is claimed, be regarded as an index of the sex of the corm. The formation process of the *apical buds proceeds regardless of the presence or absence of the assimilation* organs.

The process of the transition and retro-transition of sex may be predictable from the quantity of the assimilation products present when the formation of the new apical bud for the next year is taking place. For the female expression the greatest quantity of the formative assimilation products is required; for the male expression a medium quantity of these products is needed. In the asexual state, the sexual expression is not attained, presumably on account of the insufficient supply of the formative assimilation products.

The bibliography includes 55 titles, covering the period 1892–1924.

FIELD CROPS

Studies on the origin of cultivated plants, N. I. VAVILOV (*Tsentry Proiskhozhdeniia Kul'turnykh Rastenii. Leningrad: Inst. Bot. Appl. et Amélior. Plantes, 1926, pp. 248, pls. 8, figs. 4; Eng. trans., pp. 139–248*).—Extensive accounts are presented in both Russian and English of the investigations of the author on the origin of the principal crops of the Old World. Special attention is paid to wheat, barley, oats, rye, millet, flax, and hemp. The several chapters dealing with geographical centers of origin of cultivated crops touch on investigational methods, principal forms of Old World crops, the ecological principle involved, geographical regularities, and the origin of primary crops. Weeds as progenitors of cultivated plants and mountain districts as the home of agriculture are also considered.

The relation of seeding practices to crop quality, T. A. KIESSELBACH (*Jour. Amer. Soc. Agron., 18 (1926), No. 8, pp. 661–684*).—Review of experimental data obtained at the Nebraska Experiment Station and other stations indicated that, as a general principle with cereal crops, practices leading to maximum average yields are also satisfactory from the viewpoint of crop quality.

Where corn is a full-season crop, seeding early during the normal planting season insures earlier maturity, lower moisture content, better keeping qualities, and higher viability if exposed to low freezing temperatures. Seeding all

small grains relatively early commonly leads to higher test weight and low percentage of hull in hulled crops. Although delayed seeding of wheat tends to increase its percentage of protein, a quality sought by the milling trade, its attainment by this means is at too much sacrifice of yield to be justifiable. Under climatic conditions represented by the State of Washington, where wheat may become infected through soil-borne smut spores, minimum smut infection may be attained by extremely early or late seeding, at the expense, however, of yield. A medium early date results in reasonably low percentage of smut and maximum yield of grain.

So far as concerus quality of grain, cereals may be planted at a rate conducive to highest acre yield. With forage crops, where fineness of stem adds to palatability and reduction in waste when fed, it is desirable to seed thicker than necessary to get the maximum yield. Ordinarily the yield will not be reduced thereby, and the forage will be finer and more leafy. For silage purposes, corn may be spaced somewhat closer than for grain to get maximum tonnage of feed. Unduly heavy seeding, however, results in no gain in yield and produces silage relatively low in proportion of grain. Concerning the manner of planting, practices designed to give maximum yield are satisfactory from the quality standpoint and are most effective in farm practice.

The formalin and copper carbonate treatments of smut-infected seed wheat seem to be efficient means in most of the country for increasing the yield, test weight, and freedom from smut. Treatment with copper carbonate containing about 20 per cent metallic copper is especially recommended.

Controlling quality of crops, H. L. Walster (*Jour. Amer. Soc. Agron., 18 (1926), No. 8, pp. 618–622*).—From the viewpoint of the usual methods of grading which emphasizes test weight, wheat in the rotation of potatoes, wheat, barley, and red clover at the North Dakota Experiment Station was lower in quality in three out of four years than wheat in the rotation of oats, wheat, red clover, flax, proso, and mangels (or sugar beets). However, the flour from wheat after potatoes was uniformly of high protein content, and in two of four years produced significantly larger loaves of bread.

Variation in the chemical composition of the seeds of oleiferous plants in dependence on geographical factors [trans. title], N. N. Ivanov (*Trudy Prikl. Bot. i Selek.* (*Bul. Appl. Bot. and Plant-Breeding*), *16 (1926), No. 3, pp, 3–88, figs. 2; Eng. abs., pp. 60–88*).—Analyses of seed of flax, hemp, poppy, mustard, castor bean, colza, sunflower, sesame, safflower, and *Camelina glabrata*, grown under widely different environmental conditions in the Union of Socialistic Soviet Republics, revealed a tendency for these crops to retain the constancy of their chemical composition. Regardless of the extreme climatic conditions, flax, for instance, produced seeds with almost the same oil and protein contents at all points; only the iodine values of the oil varied. The fact that certain flax varieties had high oil contents at all stations was apparently due to their larger size of seed. The fluctuations in protein content were also slight in comparison with that observed in wheat in the same localities.

Electroculture investigations (*Jour. Min. Agr. [Gt. Brit.], 33 (1926), No. 2, pp. 102–104*).—Further pot experiments (E. S. R., 54, p. 434) at Rothamsted showed the consistent effect of electrification in increasing the grain yield of barley even in the absence of increased vegetative growth. Only small differences were observed between electrified and control plats with barley at Rothamsted and oats at Lincluden near Dumfries. A careful physiological study indicated that electrification of the plant led to fewer sterile flowers, less shriveled grains, and increased weight of grain. That in general a better result is had by electrification for a period less than the whole growing season

was again confirmed by the pot cultures of 1925. Low voltages continuously applied (1,000 volts and less) produced results as good as or better than high voltages (10,000 to 20,000).

Longevity of the legume nodule organism, T. E. RICHMOND (*Jour. Amer. Soc. Agron., 18 (1926), No. 5, pp. 414–416*).—Observations at the University of Illinois showed that legume nodule organisms can survive for many years in an acid soil in situ but are quickly killed by air drying the soil. The nodule organisms of the soy bean and cowpea were killed by a 3-year storage of a soil with a 6,000-lb. lime requirement, whereas only the soy bean organism was killed by similar storage of a soil with a 3,000- to 4,000-lb. lime requirement and both organisms survived 3 years' storage in soils needing 1 ton or less of lime. Seeds inoculated by the muddy water method retained viable organisms for only a very few days where an acid soil was used, but for almost a year with a neutral soil.

[**Field crops experiments in British Guiana, 1922, 1923, 1924, and 1925**], J. B. HARRISON and W. FRANCIS (*Brit. Guiana Dept. Sci. and Agr. Rpt. 1922, pp. 4–10; 1923, pp. 4–10; 1924, pp. 4–10; 1925, pp. 4–10*).—Experiments with sugar cane and rice are reported on as heretofore (E. S. R., 50, p. 134). Of the total cultivated area of the colony in 1925, 41.2 per cent was devoted to sugar cane and 21 per cent to rice. Leading among the sugar cane varieties in the 1926 crop were D. 625, D. 145, and D. 118, constituting 72.5, 5.2, and 3.5 per cent, respectively, of the total area in sugar cane.

[**Agronomic experiments in Morocco, 1922–23 and 1923–24**], E. MIÈGE ([*Morocco*] *Dir. Gén. Agr., Com. et Colon., Expt. Agr. Rap. Ann., 1922–23, pp. 128, figs. 7; 1923–24, pp. 158, figs. 4*).—Experiments at Casablanca, Fez, Marrakesh, and Meknes reported in these pages included varietal and cultural tests with wheat, barley, oats, rye, potatoes, and sugar beets; irrigation tests with wheat, alfalfa, cotton, tobacco, and potatoes; fertilizer trials with sugar beets, tobacco, and potatoes; and comparisons of miscellaneous legumes and grasses.

Angleton grass, V. E. HAFNER (*Texas Sta. Bul. 342 (1926), pp. 3–11, figs. 2*).—The characteristics and habits of Angleton grass (*Andropogon annulatus*) are described, with notes on methods of handling and the results of tests with the grass in different Texas localities. This grass, introduced from India, is considered valuable for pasture and hay and well adapted to the humid part of the Gulf Coastal Plains of Texas and to parts of the State having 30 in. or more of rainfall. It has succeeded on soils ranging from sandy loam to heavy clay. The grass is readily propagated from rooted runners and rooted plants and also from seed, although seed tested at the Angleton Substation have not germinated well. While Angleton grass has a deep fibrous root system and easily competes with other vegetation, it lacks root stocks and is readily eradicated.

Broomcorn, G. R. QUESENBERRY and R. R. WILL (*N. Mex. Agr. Col. Ext. Cir. 91 (1926), pp. 26, figs. 18*).—Production practices considered suitable for broomcorn raising in New Mexico are outlined, with instructions on harvesting and preparation for the market.

Seed corn curing and storing, D. F. RAINEY and F. E. FOGLE (*Michigan Sta. Circ. 96 (1926), pp. 3–15, figs. 12*).—Practical information is presented on the care and preservation of seed corn, equipment for drying and preparing seed is described, and plans, elevations, and illustrations show the essentials of several types of storage houses.

The effect of spacing on the yield of cotton, E. B. REYNOLDS (*Texas Sta. Bul. 340 (1926), pp. 3–77, figs. 15*).—Extensive spacing experiments with cotton

conducted at the station and substations since 1914 are reported on, and the results of spacing investigations without the State are summarized. The references include 123 citations.

The highest yields in general resulted from the close and medium spacing, 6 to 21 in., in the different parts of the State, except in eastern Texas, where comparatively wide spacing, 27 to 36 in., excelled. Twelve in. was found the optimum spacing at Angleton, Lubbock, and Spur, 9 to 12 in. at the station, 21 in. at Beeville and Temple, 27 in. at Nacogdoches, and 30 in. at Troup and Chillicothe. The cotton plant appears to be able to adjust itself to produce satisfactory yields within a comparatively wide range of spacing. Thinning cotton at the usual time generally produced larger yields than late or deferred thinning.

Cotton spacing, W. B. ROGERS (*Clemson Agr. Col. S. C., Ext. Circ. 78 (1926), pp. [4], fig. 1*).—Spacings for cotton recommended as a result of experiments by the South Carolina Experiment Station (E. S. R., 54, p. 636) are for the Piedmont section 1 to 2 plants per hill spaced 8 to 12 in. apart in rows 3 to 3.5 ft. wide and for the Coastal Plain section 1 to 2 plants per hill spaced 8 to 12 in. apart in 4-ft. rows. The width of the row should be varied with the fertility of the soil. These spacings did not seem to affect the normal functions of the plant or the quality of the final product.

The effect of the sharâqi period upon the yield of cotton in Egypt, E. MCKENZIE-TAYLOR (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 57 (1926), pp. [1]+22*).—Cotton yields were considerably larger on land subjected to a long summer fallow than after a short summer fallow. The decline in the yield seems directly attributable to the almost complete elimination of summer fallow due largely to the early seeding of corn. The author suggests postponing corn planting until August 10 and using the available water on rice in the northern areas.

Weather damage to cotton, R. L. NIXON (*U. S. Dept. Agr. Bul. 1438 (1926), pp. 15, figs. 4*).—Bales of cotton were fully protected in the warehouse while others were variously exposed to the weather (E. S. R., 49, p. 33) in tests at 5 representative points in the Cotton Belt.

Unprotected bales placed with their flat surfaces next the ground without turning averaged a loss of 54.7 per cent of their original gross weight, bales on poles and protected by canvas lost 2 per cent, and bales placed on poles and turned once a week, or at least after each rain, lost an average of 3.9 per cent. All of the tests showed a direct relationship between the amount of moisture absorbed and the resulting damage. Since the fungi responsible for discoloration and decay of the fibers thrive best under temperate conditions, the cotton damaged much faster during spring and summer months.

Baled cotton should evidently be placed in a properly constructed warehouse under responsible management as soon after ginning as possible. If warehousing is impracticable, the bales should be stored in a dry place out of the weather or, as a last resort, they should be edged up on poles and turned at least weekly.

Report on the cotton-growing industry of Nigeria, 1926, C. N. FRENCH (*London: Empire Cotton Growing Corp., 1926, pp. 48, pl. 1*).—The status of the industry is described from the results of surveys early in 1926.

The production of cotton, G. H. COLLINGS (*New York: John Wiley & Sons; London: Chapman & Hall, 1926, pp. XI+256, figs. 92*).—This volume relates the history and the climatic and soil requirements of cotton; discusses the morphology, classification, physiology, and chemistry of the plant; describes varieties and their classification; outlines cultural and fertilizer practices and breeding

methods; indicates important diseases and insects and their control; and traces the course of the fiber from the field to the market. Space is also accorded to by-products, feeding value of the plant and products, and the growing of American-Egyptian cotton.

Elephant grass, a new and useful fodder crop in western India, H. H. MANN (*Bombay Dept. Agr. Bul. 127 (1926), pp. [1]+7*).—Experiments at different centers in western India indicate that elephant grass should be tried as a perennial, heavy-yielding grass using a limited amount of water.

Critical notes on the Nicotianas in Argentina [trans. title], A. R. MILLÁN (*Rev. Facult. Agron. y Vet. Buenos Aires, 5 (1926), No. 2, pp. 172–188, figs. 2*).—Twenty-two wild species of Nicotiana are listed, omitting *N. tabacum*, *N. rustica*, and their cultivated varieties.

Potato storage investigations, 1924–1925 (*Canton, Pa.: Marble Lab., [1926], pp. 174, pls. 16, figs. 36*).—This report of the Pennsylvania Committee on Storage Investigations embraces a report of the investigational work carried on at the Marble Laboratory, Canton, Pa., 1924–1925, by L. M. Marble; a report of the condition of potatoes in experimental storage in the Marble Laboratory, by W. A. McCubbin; an account of field tests of the stored potatoes, by W. A. McCubbin and R. E. Hartman; and observations on potato storage conditions at the Coudersport, Pa., warehouse, 1924–1925, by W. A. McCubbin.

Rice in Azerbaijan and the adjoining districts of Persia [trans. title], M. BRZHEZITSKIĬ (BRJEZITZKY) and G. GUSHCHIN (GUSTCHIN) (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant-Breeding), 16 (1926), No. 3, pp. 235–267; Eng. abs., pp. 266, 267*).—The results of a preliminary investigation of rice in Azerbaijan and Persia indicated that local rice in these countries is a mixture of varieties which in turn are mixtures of races.

Moisture in rice before and after milling, W. D. SMITH (*Rice Jour., 29 (1926), No. 6, p. 28*).—Investigations by the Bureau of Agricultural Economics, U. S. D. A., showed that a moisture test for rough rice indicates fairly accurately within certain ranges the amount of moisture that may be expected in the rice after milling.

[Experimental work with sugar cane in Queensland, 1924 and 1925], H. T. EASTERBY (*Queensland Bur. Sugar Expt. Stas. Ann. Rpt., 24 (1924), pp. 1–12, 19–53, 57–59; 25 (1925), pp. 1–17, 26–79*).—These reports describe the further progress (E. S. R., 52, p. 735) of cultural, fertilizer, liming, green manure, and irrigation tests, trials of varieties and seedlings, and breeding work at the experiment stations in Queensland, and relate the status of the sugar industry in the State.

Sugarcane-breeding technique: Isolation of live arrows from undesired pollen through artificial rooting of canes, T. S. VENKATRAMAN and R. THOMAS (*Agr. Jour. India, 21 (1926), No. 3, pp. 203–209, pls. 2, figs. 3*).—A method by which a cane in short blade can be severed from the clump and isolated consists in inducing special rooting on the above ground portion of the stalk and removing the cane with the roots induced. Earthenware pots resembling flower pots were the only apparatus employed. The treatment had no appreciable harmful effect either on pollen formation or seed setting in the arrows.

Sulphur as a cane fertilizer, W. E. CROSS (*Facts About Sugar, 21 (1926), No. 29, pp. 688, 689*).—Application of sulfur to P. O. J. 36 and 213 sugar cane at planting at the Tucumán Experiment Station, Argentina, resulted in small but distinct increases in yields of cane and sugar during each of 3 years.

A study of cane burning before cutting, C. ALINCASTRE (*Sugar Cent. and Planters News, 7 (1926), No. 5, pp. 272–285; also in Facts About Sugar, 21 (1926), No. 25, pp. 591–594, 599*).—Observations made in Occidental Negros, P. I., during the 1924–25 season on the sugar losses due to delay in milling burnt sugar cane and comparisons of the rendements from burnt and unburnt cane indicated that when the points are not needed burning sugar cane before cutting would prove of much value if proper care were taken. By burning the cost of harvesting may be reduced from 1.50 to 1.20 pesos (75 to 60 cts.) per ton of sugar cane. Deterioration of the juice is quite rapid after 2 days of burning, and if the cane is not milled within this period the saving in labor may not compensate for the sugar loss. Burning should be done late at night or very early in the morning to avoid excessive "sweating out" of the juice and possible caramelization of sugar. The practice may be limited also by the number of cars to be loaded daily. Previous work along this line is reviewed.

An acreage census of cane varieties for the crops of 1925, 1926, 1927, J. A. VERRET (*Hawaii. Sugar Planters' Sta. Circ. 46 (1926), pp. 40*).—Tabulations show the different varieties of sugar cane and the areas devoted to each for the crops indicated on the islands of Hawaii, Kauai, Maui, and Oahu. Leading in the combined areas of 1926 and 1927 are H. 109 with 93,934 acres, Yellow Caledonia 71,299, D. 1135 33,077, Yellow Tip 14,626, Striped Tip 7,523, and Lahaina 3,583 acres.

Cultural experiments with sunflowers and their relative value as a silage crop, T. E. ODLAND and H. O. HENDERSON (*West Virginia Sta. Bul. 204 (1926), pp. 16, fig. 1*).—In comparisons on the station dairy farm, silage corn (Cocke Prolific) and sunflowers averaged about the same tonnage of green material per acre for two normal seasons, both outyielding the grain type of corn (Leaming) on this basis. The silage and grain corn in order outyielded sunflowers considerably on the air-dry basis. In the short growing season of 1924 sunflowers outyielded the two corns on both green and air-dry bases. On a somewhat poorer soil at the agronomy farm sunflowers averaged a little heavier in green tonnage per acre, but were far outyielded by both corn varieties on an air-dry basis.

Spacing the sunflowers 10 in. apart in the rows gave the best results, considering both yield and ease of handling. Leaming corn and sunflowers was not a satisfactory mixture, chiefly because of differences in maturity. Sunflowers planted at later dates did not give as uniformly good yields as when sown at the same time as corn. Sunflowers contained considerably more moisture than corn, whereas corn had a much higher carbohydrate content. Differences between the two crops in protein, ash, fat, and fiber contents were relatively small.

Botanical and agronomic investigations of annual vetches [trans. title], A. Ю. TUPIKOVA (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant-Breeding), 16 (1926), No. 1, pp. 151–246, pls. 7, figs. 6; Eng. abs., pp. 244–246*).—Annual vetches are classified into a forage group, a grain-forage group, and a third group, chiefly weeds, on the basis of extensive studies with material grown in the vicinity of Moscow. The morphological characters of the vetches studied are grouped according to their systematic value in Russian-English tables.

The determination of the most important forage vetches [trans. title], V. S. MURATOVA (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant-Breeding), 16 (1926), No. 1, pp. 99–149, pl. 1; Eng. abs., p. 105*).—A dichotomous key has been devised for the determination of important agricultural species of Vicia. The areas of geographical distribution of 12 species are indicated on an outline map.

Liguleless durum wheats of the island of Cyprus [trans. title], K. FLIAKSBERGER (C. FLAKSBERGER) (*Trudy Prikl. Bot. i Selek.* (*Bul. Appl. Bot. and Plant-Breeding*), *16* (*1926*), *No. 3, pp. 123–150, figs. 6; Eng. abs., pp. 146–150*).—Liguleless durum wheats from the island of Cyprus are described, and the phylogenetic and biological significance of the ligules in Gramineae is discussed. The author concludes that liguleless durum wheats (*Triticum durum eligulatum*), as well as soft liguleless wheats (*T. vulgare eligulatum*) and inflated forms (*T. vulgare inflatum*), are ancient forms preserved in the centers of origin.

Controlling the quality of wheat through rotation and proper crop sequence, R. I. THROCKMORTON (*Jour. Amer. Soc. Agron., 18* (*1926*), *No. 8, pp. 623–629, figs. 4*).—The effect of cropping systems on the quality of wheat was studied at the Kansas Experiment Station. The systems included (I) a 16-year rotation comprising 4 years of alfalfa and 1 year of corn and 2 years of wheat alternating for 12 years; (II) the same as (I), but 5 tons of manure per acre applied every third year; (III) the same as (II), except that brome grass replaces alfalfa; (IV) a 3-year rotation of corn, cowpeas and hay, and wheat; (V) 2 years of corn and 1 of wheat; and (VI) continuous wheat.

During the 7 years, 1916 and 1919–1924, inclusive, wheat in cropping system I averaged 19.3 bu. per acre, II 21.4, III 25.1, IV 19.2, V 14.4, and VI 15.8 bu.; contained average protein contents on 12.5 per cent moisture basis, I 15.3 per cent, II 15.1, III 12.1, IV 12.8, V 12.7, and VI 14.2 per cent; produced averages of I 169 lbs., II 185.3, III 180.1, IV 144.2, V 106.6, and VI 130.1 lbs. protein per acre of wheat; and averaged I 54 lbs., II 55.2, III 58.4, IV 56.8, V 56.8, and VI 55.5 lbs. in test weight.

Wheat grades and wheat quality, C. E. MANGELS (*Natl. Miller, 31* (*1926*), *No. 8, pp. 25–27, 71, 72, figs. 3*).—According to this contribution from the North Dakota Experiment Station the present specifications for numerical grades indicate the flour-producing capacity of wheat. The current grading system, however, does not reflect to any extent the capacity of wheat to produce flour of high baking strength. The protein content of the wheat at present is considered the best index of flour strength, and the subclass divisions of hard red spring wheat grades do not seem to be an accurate index of protein content.

Milling and baking tests with foreign and domestic wheats [trans. title], W. LAESSER (*Ann. Agr. Suisse, 26* (*1925*), *No. 5, pp. 683–704, figs. 21*).—The results of comparative tests at Bern are tabulated and discussed for varieties of wheat, spelt, and rye.

Germination of old seeds of red and sweet clover and alfalfa, G. H. DUNGAN (*Seed World, 19* (*1926*), *No. 13, p. 26*).—An experiment in the agronomy department, University of Illinois, demonstrated that seed of red clover, sweet clover, and alfalfa with initial high viability is not entirely unfit for seed purposes after 3 years. The percentage germination is reduced, and more seed should be sown to compensate therefor. Germinable seeds of red clover are injured more by age than sweet clover seed, which in turn are injured slightly more than alfalfa seed. Hard seeds of alfalfa are softened more readily by age than those of red clover, while hard seeds of sweet clover are the least affected.

Hard seed question at present, D. SCHMIDT (*Seed World, 20* (*1926*), *No. 1, p. 28, fig. 1*).—Progress is reported on a project noted previously (E. S. R., 54, p. 834).

Report of analyses of samples of seed collected in New York State, 1925 (*N. Y. State Dept. Farms and Markets, Agr. Bul. 182* (*1925*), *pp. 69*).—

Tabulations show the purity, weed seed content, and germination for 569 samples of agricultural seed, 12 samples of timothy-alsike mixtures, and 52 samples of special seed mixtures collected during 1925 and analyzed at the New York State Experiment Station.

The official seed-testing station, N. R. Foy (*New Zeal. Jour. Agr., 32 (1926), No. 5, pp. 340–347*).—Records of the average germination and purity and incidence of the principal weed seeds are tabulated and discussed for 8,146 samples of agricultural seed tested at the New Zealand Seed-Testing Station at Wellington during 1925.

Spraying and dusting experiments with weeds in 1924 and 1925 [trans. title], P. Bolin (*Meddel. Centralanst. Försöksv. Jordbruksområdet* [*Sweden*], *No. 303 (1926), pp. 117, fig. 1; Eng. abs., pp. 106–110*).—Continued investigations in Sweden (E. S. R., 54, p. 239) showed sulfuric acid solutions (3 to 4 per cent) to average more effective in controlling weeds in cereals than solutions of iron sulfate, sodium nitrate, or brine, or dusting with Hoefer's weed powder or calcium cyanamide. The greater average yields made by the crops sprayed with sodium nitrate solution seem largely due to its fertilizing effect. Calcium cyanamide similarly surpassed Hoefer's weed powder. Dusting was not as effective as spraying in weed control. Best results with powdered chemicals seemed to be had by dusting the crop when wet with dew, i. e., early in the morning, especially when the dewy morning is followed by a hot, sunny day.

Destruction of the khaki weed, C. T. White (*Queensland Agr. Jour., 25 (1926), No. 6, p. 512*).—The khaki weed (*Alternanthera achyrantha*), native of South America and said to be spreading in parts of Queensland, is reported to be easily destroyed by common salt at the rate of 1 to 2 tons per acre. A solution containing 0.2 per cent of arsenic is also indicated as effective. Hand grubbing is best in small areas.

Some crops subduing weeds [trans. title], V. P. Struve (*Trudy Prikl. Bot. i Selek.* (*Bul. Appl. Bot. and Plant-Breeding*), *16 (1926), No. 3, pp. 171–179; Eng. abs., p. 179*).—Potatoes, summer fallow, flax, *Brassica rapa*, and a mixture of vetch and oats showed ability to suppress weeds in the order given during three years at the Marussino (Tambov) Experiment Station. The seeding rate and the individual development of the crop seemed of essential importance. Too thick seedings showed as many impurities as thin ones. Only normal seedings could smother weeds. With normal seedings the weeds are subdued most effectively by crops whose growth curve parallels that of the weeds.

Three important perennial weeds of Colorado, C. F. Rogers, L. W. Durrell, and L. B. Daniels (*Colorado Sta. Bul. 313 (1926), pp. 3–15, figs. 7*).—Control methods are outlined for perennial weeds, with descriptions and specific information for the elimination of wild morning glory or bindweed (*Convolvulus arvensis*) and the two poverty weeds, woolly Franseria (*F. tomentosa*) and lesser marsh elder (*Iva axillaris*).

Idaho weeds: How to know and control them, J. C. Ayres, H. W. Hulbert, and C. B. Ahlson (*Idaho Agr. Col. Ext. Bul. 65 (1926), pp. 73, figs. 32*).—A general discussion of weeds and their control, with specific information on weeds important in Idaho.

Weeds of cultivated crops in the district of Pergamino, Buenos Aires [trans. title], L. R. Parodi (*Rev. Facult. Agron. y Vet. Buenos Aires, 5 (1926), No. 2, pp. 75–171, pls. 7, figs. 19*).—The characteristics and habitats are indicated for the commonest weeds in cultivated crops in the district of Pergamino, northwest of Buenos Aires. The weed flora in the flax and wheat seed are described, with a determinative key to the weed seeds, based on structure.

Weeds: Their indentification and control, M. P. TULLIS (*Saskatchewan Dept. Agr. Bul. 57, 5. ed., rev. and enl. (1926), pp. 88, figs. 119*).—Practical information is given regarding weed habits and on the control and eradication of annual, biannual, and perennial weeds. The characteristics and illustrations of the plants and seeds of weeds important in Saskatchewan are presented to aid in identification.

HORTICULTURE

[**Horticultural investigations at Cheshunt, England**] (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 11 (1925), pp. 8–67*).—Computed acre yields for tomatoes receiving top, base, and combined top and base dressings of manure were 40.6, 39.2, and 42.8 tons, respectively, a reversal of the previous season's results (E. S. R., 53, p. 639), when the base treated plants were slightly in the lead. Applications of graduated amounts of phosphorus, nitrogen, and potassium to tomatoes showed no benefit from the phosphates, regardless of the amount. Applications of sulfate of ammonia not only increased yields but reduced the percentage of blotchy fruits. Sulfate of potash was also effective in decreasing blotchy fruits and in stimulating yields. Indication that the maximum effective application of fertilizers had been reached in the tests was shown in reduced yields on plants receiving double the usual application of artificial fertilizers. In tomato variety tests Radio and Ailsa Craig gave the highest yields, 43.9 and 43.6 tons per acre, respectively.

In studies concerning the reduction in yield of the tomato crop resulting from the continuous use of the same soil, the maximum yield, 70.1 tons per acre, was obtained on manured plats allowed to lie idle in 1923 and 1924, leading to the suggestion that better results might be obtained with compost heaps to which the necessary fertilizers are added long in advance, rather than by applying raw materials directly to the plants. The application of grass cuttings restored the yields to practically the first year's standard, suggesting the value of green manures in soil renovation.

Work with cucumbers continued to show the value of steam sterilization. However, the character of the weather following planting determined the benefits of steaming. The application of animal manures following steaming gave poor results, a net loss of 23 per cent below the controls. The admixture of ashes in the soil was beneficial. A layer of gravel beneath the cucumber beds gave excellent results, as did the turning under of a mustard cover crop.

Steam sterilization increased the yields of plats from 28 tons in 1924 to 51 tons in 1925. The combination of steaming with cresylic acid treatment gave excellent results, suggesting the desirability of combining chemical and heat sterilization.

Carbon dioxide investigations, O. OWEN and T. SMALL (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 11 (1925), pp. 119–122*).—As in the preceding year (E. S. R., 53, p. 640), an increase in the amount of carbon dioxide in the atmosphere of greenhouses increased the yield of tomatoes, in this instance over 20 per cent above the controls. Cucumber yields were also markedly benefited. Treated plants of both species were more vigorous at the end of the growing season than control plants. A commercial apparatus for liberating carbon dioxide failed to give sufficiently high concentrations of gas, but the decomposition of sodium bicarbonate in large earthenware vessels was successful.

Dry-land gardening at the Northern Great Plains Field Station, Mandan, N. Dak., T. K. KILLAND (*U. S. Dept. Agr. Bul. 1427 (1926), pp. 16, figs. 6*).—Information is offered upon climatic relations, rotations, varieties, time of

planting, time of maturity, yields, and the general performance of various species, with suggestions upon vegetable growing in the northern Great Plains area.

Sweet-corn breeding experiments, K. Sax (*Maine Sta. Bul. 332 (1926), pp. 113–144, figs. 11*).—Following a brief discussion upon sweet-corn improvement, the author suggests that the decrease in vigor generally accompanying self-pollination is more likely due to the recombination of hereditary factors in a more or less pure homozygous condition than to any injurious effect of the process itself. This was shown in the fact that no significant differences were found in the height of plant or the weight of ear of F_1 plants, whether inbred or crossed among themselves. The second generation of crosses between Golden Bantam and Black Mexican yielded black, yellow, and white kernels in the proportion of 12:3:1. The white segregates bred true, were of high quality, and proved valuable for crossing with other varieties. The progeny of crosses between inbred strains, especially those from different sources, were usually about twice as productive as the inbred parents and were frequently much more productive than the original parents.

Crosby corn reached canning maturity about 35 days after the first silk appeared and remained in good canning condition for approximately 5 days. The comparatively long period of retaining quality is considered one of the principal reasons for the superiority of Maine sweet corn over that grown in sections where higher temperatures prevailing at time of maturity tend to hasten changes in composition.

A preliminary report on the blooming and fruiting period of the tomato plant, W. Corbett (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 11 (1925), pp. 132–135, fig. 1*).—Daily records taken on the development of tomato plants showed periodic changes in the length of time elapsing between the opening of the blossoms and the ripening of the fruit. This period lengthened through the third truss but decreased in the fourth and fifth, and had a tendency to again lengthen thereafter.

The fruiting habit of the tomato, W. Krassowska (*Kwitnienie i Owocowanie Pomidorów Przy Różnych Formach Prowadzenia Roślin. Krakow: Nakladem Towarzystwa Ogrodniczego, 1926, pp. 20, figs. 4; Eng. abs., pp. 19, 20*).—Studies at the College of Agriculture, Warsaw, Poland, indicated that in pruning the tomato the natural bearing habit of the variety must be considered. Varieties tending to produce large clusters on the lower part of the stem may be pruned lower than those tending to bear their best fruits higher up the stem. Pruning gave an increased yield of early ripe fruit.

The manuring of tomatoes, B. Thomas (*Jour. Min. Agr. [Gt. Brit.], 33 (1926), No. 4, pp. 342–346*).—In a greenhouse test at the Kirton Agricultural Institute, England, tomato plants fertilized with organic manures yielded more and better grade fruit than plants treated with inorganic materials. Of three substances, dried blood, guano, and fish meal, blood was most effective. Steamed bone meal proved a better source of phosphoric acid than did superphosphate.

Some factors influencing the period of blossoming of apples and plums, R. G. Hatton and N. H. Grubb (*East Malling [Kent] Research Sta. Ann. Rpt. 1924, pp. 81–86, pls. 3*).—Data recorded on the blossoming of apple trees budded on ordinary mixed commercial fruit stocks showed a natural grouping of varieties into early, midseason, and late season, indicating that the effect of the rootstock was not dominant over that of the inherent varietal characters. Although the blooming periods of the earliest and the latest varieties generally overlapped, in some cases this overlapping was not enough

to insure satisfactory pollination. Seasonal conditions had a marked effect upon the length of the blooming periods. Observations on unpruned and pruned trees of a single variety showed that pruning delays blossoming. In one case the unpruned trees bloomed 15 days earlier than the pruned. A well-defined effect of rootstocks on blooming period was noted in plantings of a single variety budded on a number of different stocks.

Physiology, R. C. Knight (*East Malling [Kent] Research Sta. Ann. Rpt. 1924, pp. 103, 104*).—Investigations conducted by the East Malling Research Station in collaboration with the plant physiology department of the Imperial College of Science and Technology indicated that the transpiration rates of leaves of different apple stocks were differently influenced by the same factors, while a single variety worked on the various stocks failed to show any such differences. Hence the author concludes that the effect of stock on scion can not be attributed to transpiration differences.

Studies in hardwood cutting propagation indicated that callus formation is favored by high soil moisture content, while soil aeration favors root formation. Attempts to influence rooting by the introduction of various substances into the cuttings failed to yield satisfactory results. Notable variation was recorded in the rooting ability of plum seedling stocks. Myrobolan B generally rooted 70 per cent while Myrobolan A, C, and D gave less than 10 per cent.

Observations upon softwood cuttings showed that varieties differed markedly in the optimum time for taking, in the best rooting media, etc. The Mahaleb and some of the Austera cherries, which root with difficulty by stool and layer and not at all from hardwood cuttings, may be readily rooted with softwood.

The insertion of two or three buds upon a certain stock resulted in less new stem and more blossom buds per branch, indicating that quantitative factors, apart from the normal influence of the rootstock, may affect the growth of the tree.

On "burr-knots" of fruit trees, R. G. Hatton, H. Wormald, and A. W. Witt (*Jour. Pomol. and Hort. Sci., 5 (1926), No. 3, pp. 195–204, pls. 2*).—Based on propagation tests and microscopic examinations at the East Malling Research Station, the authors conclude that burrknots are a normal characteristic of certain apple trees, thus corroborating the conclusions reached in the United States by Swingle (E. S. R., 53, p. 843). A review of early English horticultural literature and observations among practical growers showed that knot-bearing limbs have long been considered as favored propagating material because of the easy rooting tendencies.

Two years work with commercial fertilizers, C. C. Vincent (*Idaho State Hort. Assoc. Proc., 24 (1924), pp. 39–43*).—Two years' records of yields obtained by the Idaho Experiment Station following the application of various fertilizer materials in apple orchards at Dalton Gardens and Lewiston, and in apple, pear, and prune orchards in the vicinity of Moscow, failed to show any profitable results from fertilizer treatments.

Adsorption as a means of determining relative hardiness in the apple, S. Dunn and A. L. Bakke (*Plant Physiol., 1 (1926), No. 2, pp. 165–178*).—Determinations made at the Iowa State College with the aid of a colorimeter of the amounts of various dyes adsorbed from solution by the ground tissue of apple twigs of 22 varieties collected in November, 1924, at Shenandoah, Iowa, showed in the case of methylene blue and malachite green a definite alignment in accord with established hardiness. The results of the studies are believed to indicate rather conclusively that the hydrophilic colloids are able, by virtue of their relatively enormous adsorptive surfaces, to hold water within the cell and prevent death from the dehydrating force of freezing, and that the prop-

erty may be measured quantitatively by adsorption of aniline dyes from solution.

Some results of apple pruning in New Jersey, A. F. Mason (*Penn. State Hort. Assoc. Proc., 66 (1925), pp. 9–12*).—The severe pruning in 1923 of overgrown, bushy Rome Beauty apple trees resulted in decreased yields the season following the pruning. However, in 1924 the pruned trees outyielded the controls, and in both years the pruned trees produced a much higher percentage of high-grade fruit.

Progress report on apple root stock investigations, G. T. Spinks (*Jour. Bath and West and South. Counties Soc., 5. ser., 20 (1925–26), pp. 183–187*).—By the process of layering, selected apple stocks, described in an earlier report (E. S. R., 39, p. 645), were sufficiently increased to furnish material for budding to standard varieties. An examination of the root systems of clonal stocks worked with the Lane Prince Albert variety showed considerable differences in type from those of the parent rootstock. Realizing that stock propagation by seed is a more rapid and economical method of propagation, the author has budded seedlings of known parentage to the Stirling Castle variety. To test the effect of quantitative factors a lot of seedlings of unknown parentage were worked with the Bramley Seedling, following careful grading according to the size and character of the root systems. Seedlings of fruits which breed fairly true are being studied as regards their stock value.

Cherry stocks: Their behaviour in the nursery, N. H. Grubb and A. W. Witt (*East Malling [Kent] Research Sta. Ann. Rpt. 1924, pp. 87–92, pl. 1*).—A comparison of selected clonal varieties of cherry stocks with ordinary mixed commercial seedlings showed the superiority of the clonal varieties. In 14 asexually propagated stocks, 94 per cent of the trees were ready for budding at 3 years of age. At the same time seedlings at 4 years contained less than 34 per cent of comparable plants. Analyzed statistically, asexual stocks were found to be very much more uniform.

The peach orchard from cleared land to bearing trees, W. S. Anderson (*Mississippi Sta. Circ. 66 (1926), pp. 4*).—Brief directions are given for the selection of varieties, planting, cultivating, fertilizing, pruning, and the control of pests.

Studies in the root and shoot growth of the strawberry in season 1924–25, E. Ball and C. E. T. Mann (*Jour. Bath and West and South. Counties Soc., 5. ser., 20 (1925–26), pp. 190–199, pls. 3*).—Observations upon Royal Sovereign strawberry plants deflorated in the spring following their setting in the field showed them to be much more vigorous in the weeks following the natural fruiting season than comparable untreated plants. In respect to season of planting, Sir Joseph Paxton plants set in early September made much more satisfactory growth than those set in late October of the same year. Deep planting was much less harmful than shallow planting. The trimming of the roots of young strawberry plants had no effect upon the ultimate condition of the plants, although it resulted in the development of more now roots.

Banana investigations, J. S. Dash (*Trop. Agr. [Trinidad], 3 (1926), No. 8, pp. 167–169*).—Time of planting studies at the Imperial College of Tropical Agriculture, Trinidad, with suckers of the Gros Michel variety indicated the inadvisability of planting during the dry season. Furthermore the plants which survived were less productive than those set out in favorable seasons. Observations on several introduced lots of the Gros Michel banana failed to reveal any individuals resistant to Panama disease. Sugar cane served as an effective windbreak for bananas.

Grenada Giant Fig bananas placed in cold storage at temperatures averaging 48° F. failed to ripen satisfactorily, all the fruits turning black within three

weeks. However, when the bananas were subjected to a moderate cooling, about 60° for three days and then lowering to about 48°, the fruits kept in good condition and ripened satisfactorily at between 60 and 70°. A third test in which Gros Michel and Canary bananas were included gave favorable results, indicating that all three varieties are suitable for transportation to distant markets.

Regarding the curing of cacao, F. L. Stevens (*Trinidad and Tobago Dept. Agr. Bul., 21 (1925), No. 1, pp. 27–35; also in Trop. Agr.* [*Ceylon*], *66 (1926), No. 6, pp. 328–333*).—Experiments conducted at the University of Illinois with cacao pods supplied by the United Fruit Company indicated that a much higher grade product may be obtained by careful curing. Temperatures ranging from 40 to 60° C. (104 to 140° F.) maintained for several days killed the embryo of the seeds without destroying the enzymes, which are believed by the author to be essential in oxidizing the embryo to the desired light tan color. Beans cured by the experimental methods were much freer from objectionable acidity than ordinary commercial stock, leading the author to suspect that acidity is probably due to yeasts and bacteria which can not occur at the temperatures utilized in the studies. Oxidation proceeded equally well, whether beans were submerged in water or were dry.

Citrus-culture: Variety and root-stock experiments at Tauranga, J. H. Davidson (*New Zeal. Jour. Agr., 32 (1926), No. 4, pp. 219–232, figs. 17*).—Brief observations are presented upon the behavior of orange and lemon varieties upon various stocks, including lime and *Citrus trifoliata*.

Improvement of trees by bud selection, E. S. West (*Agr. Gaz. N. S. Wales, 37 (1926), No. 6, pp. 469–473, fig. 1*).—Observations at the Commonwealth Citrus Research Station at Griffith, N. S. Wales, revealed instances of bud mutation in oranges.

Manurial experiments with citrus trees, W. le G. Brereton and W. B. Stokes (*Agr. Gaz. N. S. Wales, 37 (1926), No. 6, pp. 463–468*).—Records taken at Narara, N. S. Wales, upon three plats of Valencia orange trees, all receiving 3 lbs. of bone dust and 3 lbs. of superphosphate per tree but differing in potash treatments, showed that potash favorably influences yield and the size of the fruit, but has little effect on skin texture.

Experiments on the germination of African oil palm seeds, E. A. Curtler (*Malayan Agr. Jour., 14 (1926), No. 4, pp. 84–87*).—Observations upon the effect of soaking in warm water and of immersion in 1 per cent hydrochloric acid upon the rapidity and amount of germination of African oil palm seeds showed both treatments to be slightly beneficial. However, in the case of 5 per cent hydrochloric acid germination was reduced.

Growth and correlation in the oil-palm (Elaeis guineensis), T. G. Mason and C. J. Lewin (*Ann. Appl. Biol., 12 (1925), No. 4, pp. 410–421, figs. 3*).—Observations upon 77 oil palms growing near Ibadan, Nigeria, showed that young trees have two flowering cycles, one in the autumn and one in the spring, closely corresponding to the periods of equal day and night. As the trees grow older the spring flowering cycles tend to disappear, due, in the authors' opinion, to the exhaustion of food reserves caused by the increased size of the bunches. The sex ratios of individual trees varied from season to season, the excess of male inflorescences becoming particularly noticeable in the December flowering period.

The effect on tea crop of a leguminous crop while growing, H. R. Cooper (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1925, No. 4, pp. 127–137*).—Heavy cover crops of *Cajanus indicus*, induced by large applications of lime, had a deleterious effect on tea yields, reaching a maximum of 37 per cent decrease in

one instance. The author recommends that cover crops of the nature of *C. indicus* be planted very early and cut down frequently to prevent competition with the tea.

Practical soil sterilization by heat for glasshouse crops, W. F. Bewley (*Jour. Min. Agr.* [*Gt. Brit.*], *33* (*1926*), *No. 4, pp. 297–311, pl. 1, figs. 2*).—A comprehensive discussion of the principles and practices of soil sterilization based on investigations at the Experimental and Research Station, Cheshunt. Of three methods, namely, steaming, baking, and chemical treatment, steaming is deemed by far the most efficient.

School and home gardens, C. L. Quear (*Lincoln, Nebr.: University Pub. Co., 1926, pp. VIII+248, figs. 123*).—A small handbook of practical information.

Ancestral lines of the cactus, A. Berger (*Die Entwicklungslinien der Kakteen. Jena: Gustav Fischer, 1926, pp. IV+105, figs. 87*).—The botanical relationships and probable origin of various forms of cactuses are discussed. It is considered likely that South America was the original home of the cactus family.

FORESTRY

Red alder of the Pacific Northwest: Its utilization, with notes on growth and mangament, H. M. Johnson, E. J. Hanzlik, and W. H. Gibbons (*U. S. Dept. Agr. Bul. 1437* (*1926*), *pp. 46, figs. 11*).—Red alder, described as the leading hardwood of the Pacific Northwest, is, because of its color, medium weight, and ease of working, extensively used in the manufacture of furniture, cabinets, etc. This paper discusses the distribution; supply; annual consumption; properties of the wood; seasoning practices; utilization by industries; methods of lumbering; transportation; stumpage, log, and lumber values; characteristics, growth, and yield; and perpetuation of the supply. Volume tables are presented, with notes on the uses of the wood, and a directory of producers and consumers.

Utilization of dogwood and persimmon, J. B. Cuno (*U. S. Dept. Agr. Bul. 1436* (*1926*), *pp. 43, figs. 24*).—Dogwood and persimmon woods, because of their hardness, toughness, fineness of texture, and smooth wearing qualities, are highly prized in the manufacture of shuttles, bobbins, mallet heads, pulleys, golf-club heads, and many other articles. This paper discusses the preseut distribution and the extent of the supplies of the two woods, the annual cut, methods of cutting and handling, structure and physical and mechanical properties of the wood, the manufacture of shuttle blocks and other products, and substitute species with notes on their possible value.

The mahogany tree [trans. title], A. C. Noltée et al. (*Dept. Landb., Nijv. en Handel Nederland Indië., Meded. Proefsta. Boschw., No. 15* (*1926*), *pp. II+125, pls. 30; Eng. abs., pp. 95–101*).—Information of a general nature is given concerning species furnishing commercial mahogany, the distribution of the trees throughout the world, and the silvicultural requirements.

An elementary manual on Indian wood technology, H. P. Brown (*Calcutta: Govt., 1925, pp. XIII+121, pls. 47, figs. 2*).—Original information is presented upon the gross and anatomical structure of important Indian woods.

DISEASES OF PLANTS

[Plant diseases and plant protection], Schander (*Landw. Jahrb., 60* (*1924*), *No. 2, pp. 162–191*).—Results obtained from a considerable number of tests of protectives against common diseases affecting important plants are presented, with a report and discussion of meteorological conditions in the Provinces Grenzmark and Brandenburg east of the Oder.

Spray injury, H. C. YOUNG and R. C. WALTON (*Abs. in Phytopathology, 14 (1924), No. 1, p. 61*).—A study of spray injury to apple, pear, and peach showed that injury following sulfur sprays could be classed as edge burn, leaf scald, and gooseneck with lime sulfur, and injury following scab, and yellow leaf with most types of sulfur sprays. Copper spray injury was as serious on leaves as the sulfur sprays and caused russeting on the fruit of Greening apples. Weather conditions are believed to influence the amount of injury.

Colloidal sulphur as a spray material, H. C. YOUNG (*Abs. in Phytopathology, 14 (1924), No. 1, pp. 61, 62*).—A preliminary report is given of tests of the fungicidal value of colloidal and precipitated sulfur in New York, Pennsylvania, Virginia, Illinois, and Michigan. In all States both mixtures controlled scab, and there was no injury to foliage except with one application of colloidal sulfur in New York. When applied to peaches, grapes, cherries, and pears colloidal sulfur slightly injured the foliage in some instances, but the precipitated sulfur caused no damage.

Colloidal sulphur as a spray material, H. C. YOUNG (*Ann. Missouri Bot. Gard. 12 (1925), No. 2, pp. 133–143*).—Recent studies (E. S. R., 50, p. 345) not in accordance with conditions in most of the sulfur sprays in general use, led to experimentation testing the comparative values of representative sprays in a commercial way. Although the seasonal conditions made it difficult to draw definite conclusions, the results show that the precipitated sulfur was not quite so effective as lime sulfur, although it was more effective than dusts, dry mix, or wettable sulfur. Its value exceeded that of lime sulfur on account of comparative freedom from foliage injury and high percentage of clean fruit.

Precipitated sulfur showed no spray injury to apple foliage or young peach leaves. Colloidal sulfur caused some burning, but this was not economically important.

On sweet and sour cherries, grapes, and plums, colloidal sulfur caused injury in the form of burning on grapes, while precipitated sulfur caused none in any case. Both showed inferiority in cases cited as regards adherence.

Commercial products listed are expected to prove fungicidal, provided their reaction point is around pH 4.2–5.

Experiments with inoculated sulphur for scab control, J. G. LEACH and R. C. ROSE (*Abs. in Phytopathology, 14 (1924), No. 1, p. 57*).—Experiments with inoculated sulfur are said to have yielded variable results, and the type of soil on which the sulfur is applied is believed to influence the effectiveness of the treatment.

Fusarium culmorum in Oregon, its varieties and strains that cause disease of cereals and grasses, J. P. ROSE (*Abs. in Phytopathology, 14 (1924), No. 1, p. 49*).—The author claims that in addition to *F. culmorum* there are in Oregon at least three varieties and one strain, all of which cause disease in Triticum, but in different degrees. *F. culmorum* and closely allied forms attack wheat and oats, and *F. culmorum leteius* attacks wheat, oats, corn, rye, barley, and various grasses.

Fusarium culmorum var. leteius, a cause of disease in cereals and grasses, J. P. ROSE (*Abs. in Phytopathology, 14 (1924), No. 1, p. 50*).—As a result of laboratory, greenhouse, and field experiments it was found that this fungus caused a seedling blight of spring and winter wheats, as well as diseased conditions of mature plants of barley, oats, rye, and several grasses. In controlled inoculation experiments the fungus was found to cause a severe scabbing of wheat.

A bacterial disease of broomcorn and sorghum, C. ELLIOTT and E. F. SMITH (*Abs. in Phytopathology, 14 (1924), No. 1, p. 48*).—Broomcorn, sorgo,

grain, and grass sorghums are said to be attacked by *Bacterium andropogoni* sorgos being most susceptible, grass sorghums most resistant, and the grai sorghums intermediate. Attempts to infect maize and millets were unsuc cessful.

Mosaic cross-inoculation studies, O. H. Elmer (*Abs. in Phytopathology, 1 (1924), No. 1, p. 55*).—The transmission of mosaic is reported from 14 othe genera of plants to tobacco; from 8 genera to tomato; from *Curcurbita mos chata* to cowpea and soy bean; from tomato to *C. moschata;* from eggplant t cowpea; and from tobacco to *Martynia louisiana.*

Wheat resistant to mildew, Erysiphe graminis, E. B. Mains (*Abs. i Phytopathology, 14 (1924), No. 1, p. 48*).—Tests were made of 650 strains o wheat grown under greenhouse conditions to determine their susceptibility i the seedling stage to mildew. Several varieties of bread wheats were practicall immune, while among the other wheats Khapli, Vernal emmer, and einkorn wer outstanding in resistance.

Copper carbonate prevents stinking smut (*U. S. Dept. Agr., Misc. Circ. 7 (1926), pp. 4, figs. 2*).—Directions are given for the use of copper carbonate fo the control of bunt or stinking smut of wheat.

Relative susceptibility of red clover to anthracnose and mildew, J. Mon teith, Jr. (*Abs. in Phytopathology, 14 (1924), No. 1, pp. 62, 63*).—Italian clover which are susceptible to anthracnose are most resistant to mildew, while som American strains which are resistant to anthracnose are very susceptible t mildew.

An investigation of clover root rot, W. J. Young (*Abs. in Phytopatholog 14 (1924), No. 1, p. 63*).—The author claims that some species of Fusarium as sociated with clover root rot are weak parasites which infect clover but requir the cooperation of other deleterious agencies to cause serious damage.

Experiments to show the effects of certain seed treatments on corn, C. S Reddy and J. R. Holbert (*Abs. in Phytopathology, 14 (1924), No. 1, pp. 44 45*).—Tests are reported of the effect of treating corn with a number of see disinfectants used in various ways.

Formaldehyde, calcium hypochlorite, corrosive sublimate, and copper sulfat treatments decreased stands and yields. No detrimental effects, and frequentl increased stands, followed the use of Chlorophol on nearly disease-free seed, o in composite samples of corn infected with Fusarium, Cephalosporium, Diplodia and scutellum rot. There was an increase in stands and yields from Diplodia infected seed treated with Chlorophol, and a decrease from composite see samples infected with Cephalosporium, Fusarium, and scutellum rot.

Second progress report on studies of corn seed germination and th prevalence of Fusarium moniliforme and Diplodia zeae, L. E. Melcher and C. O. Johnston (*Abs. in Phytopathology, 14 (1924), No. 1, p. 45*).—In con tinuation of previous observations (E. S. R., 53, p. 850) the authors report tha practically every ear of commercial white and Pride of Saline corn examine was infected with either or both *F. moniliforme* and *D. zeae*. *D. zeae* varie in its occurrence from year to year, but *F. moniliforme* was always abundant Freedom from *F. moniliforme* is not considered as important as seedling vigor i securing a stand and yield of corn.

Common molds of corn seed in relation to yield, C. D. Sherbakoff (*Abs in Phytopathology, 14 (1924), No. 1, p. 46*).—Field experiments are said to indi cate that corn seed freed from *Fusarium moniliforme* did not give any bette yield than untreated seed of the same corn. The author concludes that unde the conditions of his experiments contamination of corn seed with the mold ha no effect on the yield.

Relation of internal cob-discoloration to yield in corn, R. A. JEHLE, F. W. OLDENBURG, and C. E. TEMPLE (*Abs. in Phytopathology, 14 (1924), No. 1, p. 46*).—Plats of corn were grown from seed taken from ears, the cobs of which were discolored, and from ears that showed no discoloration. A correlation was shown between internal cob discloration and yield of corn which was pronounced on light sandy and poor clay soils.

Corn resistant to rust, Puccinia sorghi, E. B. MAINS, F. J. TROST, and G. M. SMITH (*Abs. in Phytopathology, 14 (1924), No. 1, pp. 47, 48*).—A report is given of tests of about 2,800 plants of 15 selfed varieties of sweet and 5 selfed varieties of dent corn to determine their susceptibility to corn rust. Varying resistances were noted. Ten varieties of sweet and all dent varieties produced some resistant individuals.

Studies of anthracnose infection in cotton seed, C. A. LUDWIG (*Abs. in Phytopathology, 14 (1924), No. 1, p. 52*).—A summary is given of investigations on the control of cotton anthracnose. Seed stored for three years under laboratory conditions was found safe for planting. Heating and drying the seed did not control the disease, and delinting seed with sulfuric acid, followed by sterilizing with corrosive sublimate, reduced but did not eliminate it.

Physalis and cucurbit mosaic intertransmissible, M. N. WALKER (*Abs. in Phytopathology, 14 (1924), No. 1, p. 56*).—Inoculation experiments have shown that mosaic of *Physalis* sp. and cucurbits is interchangeable.

Experiments on the control of cucurbit mosaic, S. P. DOOLITTLE and M. N. WALKER (*Abs. in Phytopathology, 14 (1924), No. 1, p. 56*).—The elimination of pokeweed, milkweed, *Physalis* spp., and wild cucumber practically controlled mosaic disease of cucumbers.

Further investigations on the pasmo disease of flax, W. E. BRENTZEL (*Abs. in Phytopathology, 14 (1924), No. 1, pp. 48, 49*).—Additional information is presented regarding the disease of flax caused by *Phlyctacna linicola* (E. S. R., 53, p. 851).

Tipburn of lettuce, R. C. THOMPSON (*Colorado Sta. Bul. 311 (1926), pp. 3-31, figs. 6*).—The results are given of three years' field and greenhouse studies of some of the factors involved in tipburn injury, and the data presented are said to give a new aspect to the physiology of lettuce tipburn. The author claims that the generally accepted supposition that the disease results from excessive loss of water from the leaf has not been substantiated by his experiments. The failure met with in every attempt to produce tipburn by subjecting plants to conditions favorable for rapid transpiration, in contrast with the ease with which the disease can be produced under other conditions, indicates that the injury does not result from desiccation of the tissue. Furthermore, high humidity was found to be favorable for the development of the disease. The development of tipburn in an environment of very reduced light intensity, at a temperature near 70° F., and under conditions of high humidity, is believed to eliminate the possibility of its resulting from direct physical injury by heat, light, or dry atmosphere.

Summarizing other conclusions, it appears that lettuce plants high in sugar content are more resistant to tipburn than those low in total sugars. Diseased plants are usually more succulent than healthy ones, and excessive irrigation favors the development of tipburn. Light was found to have little influence as a causal agent, practically all the burning occuring in darkness. The disease is said to develop under conditions favorable for active respiration, and the indications are that it is a respiration phenemenon due to excessive accumulation of respiratory products.

It was found that the conditions which limited the rate of growth reduced the extent of tipburn. Limited water supply, low temperature, concentrated

soil solution, and root binding when grown in pots, all resulted in checked growth and less tipburn.

Formaldehyde and other disinfectants in the control of lettuce diseases, W. S. BEACH (*Pennsylvania Sta. Bul. 202 (1926), pp. 3–28, figs. 7*).—The growing of lettuce in the open field, coldframe, or seed bed is said to be seriously affected by attacks of *Sclerotinia sclerotiorum*, *Botrytis* sp., *S. minor*, and *Rhizoctonia solani*.

The author conducted a series of experiments at the station field laboratory at Bustleton, near Philadelphia, for the control of these diseases, especially lettuce drop caused by *S. sclerotiorum*.

As the result of tests of various treatments extending from 1919 to 1926, lettuce seed beds treated with formaldehyde showed a reduction in the prevalence of *S. sclerotiorum*, and seedlings transplanted to the field showed an increase in the percentage of stand with seed-bed treatment. In the transplanted crop the control was mainly that of *Botrytis* sp. and *R. solani*. Treatments with formaldehyde gave a largely increased return only when the soil was used primarily for the growth of lettuce seedlings.

An investigation of the killing effect of formaldehyde upon the sclerotia of *S. sclerotiorum* in garden soil at the laboratory showed that efficient destruction of the sclerotia occurred when near the surface of the soil. The treatments were less effective than those reported by Krout (E. S. R., 49, p. 246), due, it is believed, to the heavier nature of the soil, preventing the thorough distribution of the fungicide. Factors of importance to be considered as favoring the efficiency of formaldehyde control of lettuce drop are a damp condition of the sclerotia prior to treatment, a loose or friable condition suitable to the soil, and the working of the soil in the course of treatment to aid the even distribution of the disinfectant.

In the author's experiments formaldehyde was spread upon the soil in very concentrated strength followed by the application of water. This did not show any difference in efficiency as compared with applications of a 1:100 strength of formaldehyde, but there was an important saving in the labor of application.

The test of a considerable number of fungicides and chemicals besides formaldehyde for the control of drop showed that none were efficient in reducing the disease that were not injurious to the crop or too expensive for use.

Pocket atlas of potato diseases.—II, Plant excepting tubers, O. APPEL (*Taschenatlas der Kartoffelkrankheiten. II. Teil. Staudenkrankheiten. Berlin: Paul Parey, 1926, pp. [25], pls. 20*).—This little book, uniform in plan and treatment with the first volume, previously noted (E. S. R., 55, p. 47) and treating of tuber diseases, deals with diseases of the rest of the plant, considered separately.

Potato seed treatment tests in Manitoba, G. R. BISBY (*Abs. in Phytopathology, 14 (1924), No. 1, p. 58*).—Neither corrosive sublimate, copper sulfate, copper carbonate, nor Semesan exerted any effect in preventing the development of black scurf in the soil. Semesan increased the yield somewhat. Both inoculated and noninoculated sulfur reduced scab but did not lessen the amount of black scurf. All treatments gave better results in controlling scab than black scurf.

Loss of strength of mercuric chloride solutions used for treating potatoes, R. P. WHITE (*Abs. in Phytopathology, 14 (1924), No. 1, p. 58*).—Experiments are said to show that the strength of a 1 to 1,000 corrosive sublimate solution, used to disinfect potato tubers, was reduced to 57.4 per cent of the original when 4 lots of whole tubers were treated, and to 12.5 per cent when cut tubers were so treated. The weakening of the strength of the solution is

said to be proportional to the surfaces exposed that may act as absorbers of the mercury ions.

Spraying vs. dusting for potatoes, J. G. LEACH (*Abs. in Phytopathology, 14 (1924), No. 1, pp. 57, 58*).—Experiments conducted in 1922 and 1923, in which Bordeaux mixture, copper calcium arsenate, and nicotine dusts were compared, show increased yields of 34 per cent for the liquid and 12 per cent for the dust applications in 1922, and 9 and 3 per cent, respectively, in 1923.

Some factors influencing the development of potato scab, G. B. SANFORD (*Abs. in Phytopathology, 14 (1924), No. 1, pp. 58, 59*).—Experiments under controlled conditions of moisture and temperature showed that a maximum of scab occurred in dry soils at from 14 to 22° C. (57.2 to 71.6° F.) and soil moisture appeared to exert a greater effect on the development of scab than temperature. Scab developed in the drier soils, while moist soils tended to inhibit growth. Dry soils were more acid than the same soils moistened. Tubers were most susceptible to scab before they reached 0.5 in. in diameter. With the Cobbler variety the maximum infection occurred between 40 and 50 days after planting.

Further results in the inheritance of immunity to potato wart, F. WEISS and C. R. ORTON (*Abs. in Phytopathology, 14 (1924), No. 1, p. 59*).—Tests of first generation hybrid potatoes and a few F_2 plants showed in their reaction to wart disease that immunity was dominant and that reciprocal crosses between immune and susceptible parents reacted similarly. Indications were obtained of there being two factors producing immunity which act simultaneously.

Infection-court in radish black-root, J. B. KENDRICK (*Abs. in Phytopathology, 14 (1924), No. 1, p. 66*).—The natural wound at the point where the secondary root emerges from the cortex of the primary root is said to be the avenue of infection for the black root fungus (*Rheosporangium aphanidermatus*).

The relation of Chenopodium murale to curly-top of the sugar beet, E. CARSNER and C. F. STAHL (*Abs. in Phytopathology, 14 (1924), No. 1, p. 57*).—Attention is called to the fact that leafhoppers which winter on *C. murale* do not transmit curly top to sugar beets or produce it in a very mild form. This is believed due probably to an attenuation of the virus when passed through a resistant plant.

Sugar beet seed disinfection with formaldehyde vapor and steam, C. RUMBOLD (*Abs. in Phytopathology, 14 (1924), No. 1, p. 66*).—Exposing sugar beet seed balls for 20 minutes to a mixture of formaldehyde vapor and steam, with a temperature of 140° F., was found to kill fungus spores and bacteria associated with the seed balls. Field tests have shown no decrease in germination, and an increase in production from treated seed is reported.

Root diseases of sugar cane in Porto Rico, M. T. COOK (*Abs. in Phytopathology, 14 (1924), No. 1, p. 59*).—The author reports the presence of *Colletotrichum falcatum* on roots of weak and dead canes.

Minnesota sunflower diseases in 1923, A. W. HENRY and H. C. GILBERT (*Abs. in Phytopathology, 14 (1924), No. 1, p. 64*).—Sunflowers are said to have been defoliated in different sections of Minnesota by *Septoria helianthi* and *Puccinia helianthi-mollis*.

The mosaic disease of sweet potatoes, with special reference to its transmissibility, H. R. ROSEN (*Arkansas Sta. Bul. 213 (1926), pp. 16, pl. 1, figs. 3*).—In 1920 the author described a mosaic disease of sweet potatoes occurring in Arkansas (E. S. R., 44, p. 345), and since that time it has been reported to occur in Florida, Mississippi, Texas, and Kansas. Only one variety, Nancy Hall, has thus far been found susceptible to the disease.

In the previous account the author reported his inability to transmit the disease through artificial infections, but subsequent experiments have proved

its infectious nature. It was found necessary to keep the plants in a growing condition for 12 or 13 months by inoculating them in the field, growing slips from them in the greenhouse over winter, and transplanting into the field. When this procedure is followed, it is found that the disease develops gradually, becoming more severe as time advances, until a certain maximum is reached. Frequently only a small proportion of the runners show the disease on any one plant. There was also noted a recedence of the disease on some plants which had at one time been severely infected.

The results of this investigation are said to suggest that the disease is not capable of being transmitted to healthy plants under natural conditions in the northern sweet potato sections, while in the southernmost regions, as around the Gulf of Mexico, there is ample opportunity for transmission.

Observations on malformed tassels of teosinte plants infected with downy mildew, J. H. CRAIGIE and W. H. WESTON, JR. (*Abs. in Phytopathology, 14 (1924), No. 1, p. 49*).—A description is given of abnormal growths of teosinte infected with *Sclerospora philippinensis*.

Angular leaf-spot and wildfire infection of tobacco plant beds by spitting, W. D. VALLEAU and C. HUBBARD (*Abs. in Phytopathology, 14 (1924), No. 1, p. 51*).—The authors claim that the habit of laborers of chewing natural leaf tobacco of the previous crop and spitting in seed beds is responsible for the occurrence and spread of diseases.

Disinfection of tobacco seed against wildfire, J. JOHNSON and H. F. MURWIN (*Abs. in Phytopathology, 14 (1924), No. 1, pp. 50, 51*).—Formaldehyde and corrosive sublimate treatments have been found not suited for disinfecting tobacco seed against *Bacterium tabacum*. Experiments of the authors with other methods showed that treatment of seed for 15 minutes in a 1 to 1,000 solution of silver nitrate gave good disinfection without injury to the seed.

Experiments with dusting and spraying for the control of tobacco wildfire in seed-beds, J. JOHNSON (*Abs. in Phytopathology, 14 (1924), No. 1, p. 50*).—The application of copper-lime dusts and Bordeaux mixture sprays to control seed bed infection was insufficient in most cases to overcome possible damage resulting from transplanting slightly diseased plants in the field. Dusts and sprays are believed to be partially beneficial through the mechanical barrier they offer to infection.

Progress report on Phytophthora-resistant tobacco, W. B. TISDALE (*Abs. in Phytopathology, 14 (1924), No. 1, pp. 51, 52*).—When tested on infested soil, plants grown from seed of healtby Big Cuban tobacco in badly diseased fields showed a high degree of resistance to black shank caused by *P. nicotianae*.

Progress report upon the resistance of commercial strains of tobacco to root-rot, C. R. ORTON and O. OLSON (*Abs. in Phytopathology, 14 (1924), No. 1, p. 51*).—Three commercial strains and two others of less importance of Pennsylvania Broadleaf and Havana types of tobacco have been found highly resistant to *Thielavia basicola*.

Cytological studies on tobacco mosaic, T. E. RAWLINS and J. JOHNSON (*Abs. in Phytopathology, 14 (1924), No. 1, pp. 55, 56*).—Cytological studies on tobacco mosaic are said to have shown at least three distinct abnormal cell inclusions in chlorotic tissue, but no conclusion is reached as to their causal connection with the disease.

The mosaic disease of Nicotiana glutinosum not distinct from tobacco mosaic, M. N. WALKER (*Abs. in Phytopathology, 14 (1924), No. 1, p. 57*).—The identity of the mosaic of *N. glutinosum* with that of tobacco is affirmed.

A study of resistance to western yellow blight of tomato varieties, J. W. LESLEY (*Hilgardia [California Sta.], 2 (1926), No. 3, pp. 47–66, fig. 1*).—The

results are given of comparative tests of the resistance of varieties, selections, and hybrid tomatoes to the western yellow blight. The experiments were carried on in two localities for three seasons.

The disease is said to have varied widely, according to the season and place of trial. Against an attack of moderate severity in which about half the plants of the check varieties Stone and Santa Clara Canner blighted in the whole season, Dwarf Champion, Red Pear, and Dwarf Aristocrat showed a fair degree of resistance. They also showed resistance to a more severe attack if the first part of the blight period only was taken into account. The Globe variety is reported somewhat resistant, while Norton was found about as susceptible as Stone. The currant tomato appeared somewhat more susceptible to blight than Santa Clara Canner. None of the varieties had sufficient resistance to survive an attack of extreme severity in the early part of the season. Three years' selection for blight resistance in the commercial variety Santa Clara Canner resulted in strains with resistance about equal to that of the dwarfs and Red Pear.

The author claims that the resistant character of the dwarfs behaves as a recessive and appears to depend on the gene for dwarf or possibly on a gene or genes more or less closely linked with it. The reaction of the variety Red Pear and the standard selection showed that resistance might be obtained without the gene for dwarf. It is believed that if resistance is genetically of more than one kind, it might be possible by crossing to breed a variety with increased resistance to blight.

Studies on apple blotch in Ohio, W. G. Stover and C. May (*Abs. in Phytopathology, 14 (1924), No. 1, p. 60*).—An examination of Smith Cider apple twigs showed viable spores in blotch cankers from the middle of April until the middle of August. The first infections were found from June 4 to 8, inclusive, or 16 days after the fall of the petals, and they continued until after July 27. The disease was first observed on fruits on June 29. It is believed that many, if not all, twig cankers originate from petiole infections.

Bordeaux mixture in five applications gave an average of 90 per cent of the fruit blotch free. No one application was more important than any of the others.

First progress report on the study of apple scab under Ohio conditions, W. G. Stover and H. W. Johnson (*Abs. in Phytopathology, 14 (1924), No. 1, p. 60*).—Several phases of the apple scab problem were studied on Rome Beauty trees in a season favorable for scab development, 86 per cent of the fruit being scabbed on unsprayed trees. The discharge of ascospores of *Venturia inaequalis* began on April 4 and continued until June 8. The disease was noticed first on the leaves on May 22 and on the fruit on June 4.

Liquid lime sulfur and Bordeaux mixture gave good control, but neither sulfur dust nor copper arsenic dust was commercially satisfactory. Fair control was secured on trees sprayed with lime sulfur before bloom and dusted with sulfur afterwards. Some foliage injury followed the application of Bordeaux mixture after blooming. The pink spray was the most important single application, the prepink spray having been of practically no value.

Functional diseases of apples in cold storage, F. Kidd and C. West (*[Gt. Brit.] Dept. Sci. and Indus. Research, Food Invest. Bd. Spec. Rpt. 23 (1925), pp. VI+15, pls. 13, fig. 1*).—The several sections of this report (which is said in a prefatory note to bring to date a previous paper bearing the same title) deal with apple scald, internal breakdown, brown heart, and frost injury. Literature cited includes 33 titles.

Functional diseases of apples in cold storage (*Jour. Dept. Agr. Victoria, 24 (1926), No. 3, pp. 152–154*).—An abridgement by J. E. Harrison has been prepared of the report presented by Kidd and West as above noted.

Seed transmission of root-knot nematode resistance in the peach, J. A. McClintock (*Abs. in Phytopathology, 14 (1924), No. 1, p. 62*).—Second generation seedling peach trees grown in nematode-infested soils are said to indicate that nematode resistance is transmitted to a high degree through at least two generations.

Diseases of raspberries and blackberries, B. O. Dodge and R. B. Wilcox (*U. S. Dept. Agr., Farmers' Bul. 1488 (1926), pp. II+33, figs. 20*).—Popular descriptions are given of mosaic and related diseases of raspberries and various fungus diseases of raspberries, blackberries, and dewberries, together with suggestions for their control.

Powdery mildew of raspberries, J. G. Leach and J. L. Seal (*Abs. in Phytopathology, 14 (1924), No. 1, p. 61*).—Attention is called to a mildew affecting red and black raspberries in Minnesota, the affected plants showing considerable resemblance to mosaic or leaf curl.

Transfer of mosaic disease from red to black raspberries, R. B. Wilcox and F. F. Smith (*Abs. in Phytopathology, 14 (1924), No. 1, p. 55*).—Field and greenhouse experiments have shown that the aphid (*Amphorophora rubi*) is capable of transmitting mosaic from red to black raspberries.

Three little known diseases of strawberries, C. D. Sherbakoff (*Abs. in Phytopathology, 14 (1924), No. 1, pp. 60, 61*).—The author reports the occurrence in Tennessee of a lilac soft rot of strawberries associated with a species of Pythium; a hard rot, from which a Rhizoctonia was isolated; and a black rot, from which a sterile fungus was cultured.

Fungous diseases of the China aster, W. O. Gloyer (*Abs. in Phytopathology, 14 (1924), No. 1, p. 64*).—The leaf spots caused by *Ascochyta asteris*, *Botrytis cinerea*, *Coleosporium solidaginis*, and *Septoria callistephi* were controlled with Bordeaux mixture. Ascochyta, Botrytis, *Fusarium* sp., and Septoria are seed borne, and seed treatment with corrosive sublimate is said to be more practicable than spraying. Botrytis, Fusarium, *Rhizoctonia solani*, and Septoria may cause damping-off and rot. Asters are said to be subject to other diseases during the seedling and seed producing stages, but Fusarium and Septoria may attack them at any period in their growth.

Septoria and damping-off were controlled by applying corrosive sublimate (1 to 2,000) about the seedlings.

Insect transmission of aster yellows, L. O. Kunkel (*Abs. in Phytopathology, 14 (1924), No. 1, p. 54*).—Experiments are cited which indicate that aster yellows is transmitted by the leafhopper, *Cicadula sex-notata*. This insect is believed to be responsible for most if not all of the spread of the disease about New York City.

Two bacterial diseases of gladiolus, L. McCulloch (*Abs. in Phytopathology, 14 (1924), No. 1, pp. 63, 64*).—A leaf blight of gladiolus caused by *Bacterium gummisudans* and a rot of the basal portions of the leaves due to *B. marginatum* are briefly characterized. *B. marginatum* also causes a characteristic disease of the corms (E. S. R., 52, p. 654).

A flagellate infection of milkweeds in Maryland, F. O. Holmes (*Abs. in Phytopathology, 14 (1924), No. 1, p. 54*).—The presence of *Herpetomonas elmassiani* in all parts of *Asclepias syriaca*, except the seeds and roots, is reported.

Present status of stem and bulb nematode in America, G. H. Godfrey (*Abs. in Phytopathology, 14 (1924), No. 1, p. 62*).—Attention is called to the increasing importance of *Tylenchus dipsaci*, which is becoming widespread in

this country. The possibility of strains of the nematode and the adaptation of new hosts to it are pointed out.

Chestnut blight in Europe (Endothia parasitica), H. METCALF (*Abs. in Phytopathology, 14 (1924), No. 1, p. 52*).—The occurrence of chestnut blight is reported at Bruges, Belgium, and the dead funges has been found on a chestnut staging pole in London. It is thought that the fungus may have been carried to Europe on chestnut poles or timber during the war.

Control methods against chestnut black canker [trans. title], J. DUFRENOY (*Off. Agr. Régional Massif Cent., Clermont-Ferrand, Bul. 5 (1925), pp. 27, pl. 1, figs. 11*).—Recognizing, as most probably the primary agent in European chestnut black canker, *Blepharospora cambivora*, previously described and more recently reported upon by Petri (E. S. R., 54, p. 255), the author gives a somewhat circumstantial discussion of this disease, control measures tested or proposed, and attempts at reconstitution of growths destroyed by chestnut black canker.

Observations on the Douglas fir canker (Phomopsis pseudotsugae) in Great Britain, H. METCALF (*Abs. in Phytopathology, 14 (1924), No. 1, p. 52*).—Douglas fir canker is reported in England and Scotland, where the Douglas fir has been extensively planted, but not as yet in America or Continental Europe.

Wind dissemination of aeciospores of Cronartium ribicola, L. H. PENNINGTON (*Abs. in Phytopathology, 14 (1924), No. 1, pp. 52, 53*).—The extensive distribution of the white pine blister rust in the Pacific Northwest is attributed to the dissemination of wind-borne aeciospores of the fungus.

Survey of blister rust infection on pines at Kittery Point, Me., and the effect of Ribes eradication in controlling the disease, G. B. POSEY and E. R. FORD (*Abs. in Phytopathology, 14 (1924), No. 1, p. 53*).—Complete eradication of Ribes in 1917 is said to have prevented further infection of pines and permitted natural restocking of the area.

Controlling white pine blister rust in the Northeastern States, E. C. FILLER (*Abs. in Phytopathology, 14 (1924), No. 1, p. 53*).—Since the inauguration in 1917 of the campaign for the eradication of Ribes as a control measure against the spread of white pine blister rust, more than 2,500,000 acres have been practically cleared, and the cost has been reduced from 72 cts. per acre in 1918 to 20 cts. in 1923. Further commercial damage to white pines is believed to have been prevented in the areas treated through the eradication of Ribes.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Voles of the genus Phenacomys, A. B. HOWELL (*U. S. Dept. Agr., Bur. Biol. Survey, North Amer. Fauna No. 48 (1926), pp. IV+66, pls. 7, figs. 11*).—The first part of this work (pp. 1–37) consists of a revision of the genus Phenacomys, in which 10 forms are recognized. The second part (pp. 39–60) deals with the life history of the red tree mouse (*Phenacomys longicaudus* True), including an introduction, description of the nests, young, food, habits, behavior, and enemies. A bibliography of four pages is appended.

The normal food of *P. longicaudus* apparently consists solely of the fleshy part of the needles and the bark from the tenderest growth of the twigs of fir trees, and in captivity it will accept no items other than coniferous even though reduced to dire straits of hunger. Experiments with various fare, including cereals, fruits, vegetables, grasses, and twigs of deciduous trees and of redwood, failed to show that any of these was sampled or even noticed. The mouse's manner of obtaining food is to cut from the tree tender, terminal twigs 3 to 8 in. long. Some of these are inadvertently dropped to the ground,

many are probably eaten upon the spot, and some are carried to the nest, if near by, for more leisurely consumption.

A short season and its effect upon the preparation for reproduction by the Columbian ground squirrel, W. T. SHAW (*Ecology, 7 (1926), No. 2, pp. 136–139, pl. 1*).—This is a further contribution on the biology of the Columbian ground squirrel from the Washington Experiment Station (E. S. R., 55, p. 757).

The susceptibility of the coyote (Canis lestes) to tularaemia, R. R. PARKER (*Pub. Health Rpts. [U. S.], 41 (1926), No. 28, pp. 1407–1410*).—The author found that three young coyotes, 4 to 6 months of age, became infected with acute tularaemia by feeding them the tissues of Belgian rabbits and guinea pigs just dead of typical infections. Death occurred in 13, 22, and 53 days after the first feed of infectious material. It is pointed out that the susceptibility of coyotes and the evident possibility of fatal infection suggest that tularaemia may be a factor, at least, in the diminution of the abundance of coyotes which is so frequently noted following the decimation of rabbit populations in the same localities.

Fur laws for the season 1926–27, F. G. ASHBROOK and F. L. EARNSHAW (*U. S. Dept. Agr., Farmers' Bul. 1515 (1926), pp. II+28*).—This is the twelfth annual summary of the fur laws (E. S. R., 54, p. 52).

Directory of officials and organizations concerned with the protection of birds and game, 1926, compiled by T. DENMEAD and F. L. EARNSHAW (*U. S. Dept. Agr., Dept. Circ. 398 (1926), pp. 12*).—This is the usual annual directory (E. S. R., 54, p. 256).

The evolution of ornithology, M. BOUBIER (*L'Évolution de l'Ornithologie. Paris: Libr. Félix Alcan, 1925, pp. II+308*).—A discussion of the advancement made in the field of ornithology.

Aviculture (*London: Avicultural Society, 1925, vol. 1, pp. [7]+326+16, pls. 27*).—A treatise consisting of contributions from nine authors on the management of foreign and British birds in captivity.

New records of nematodes of birds, E. B. CRAM (*Jour. Parasitol., 12 (1926), No. 3, pp. 180, 181*).—The author records the collection of *Dispharynx spiralis* from the turkey (*Meleagris gallopavo*), at Churchton, Md., and the collection by A. A. Allen, of Cornell University, of *Echinuria uncinata* from the black duck (*Anas rubripes*), *Contracaecum micropapillatum* from the goldeneye (*Glaucionetta clangula*), and *Contracaecum* sp. from the ruffed grouse (*Bonasa umbellus*). It is said to be apparent from the examination of specimens from New England, New York, and Michigan that *B. umbellus* commonly harbors *Ascaridia lineata*, the species that is common in chickens in the United States.

A key to the snakes of the United States, Canada, and Lower California, F. N. BLANCHARD (*Mich. Acad. Sci., Arts, and Letters, Papers, 4 (1925), pt. 2, pp. XIII+65, figs. 78*).—An illustrated key for the separation of 191 species and subspecies of snakes, with data on the geographic distribution of each.

The bull snake as a natural enemy of injurious rodents, F. L. HISAW and H. K. GLOYD (*Jour. Mammal., 7 (1926), No. 3, pp. 200–205, figs. 3*).—This contribution from the Kansas Experiment Station discusses methods by which the bull snake *Pituophis sayi* (Schl.) captures its prey, the relation of ecdysis to feeding habits, and the potentiality of the snake as a destroyer of rodent pests. It is shown to be an important enemy of pocket gophers, the burrows of which are entered by the snake.

The relation of animal pest control to conservation, J. J. DAVIS (*Ind. Acad. Sci. Proc., 40 (1924), pp. 375–382, figs. 8*).—This account is based upon the replies received to a questionnaire sent to the county agricultural agents of Indiana.

Fighting pests with airplanes, A. W. Morrill (*Calif. Cult.*, *67* (*1926*), *No. 3*, *pp. 53*, *71*, *fig. 1*).—In reviewing control work through use of the airplane, the author records the application of dust to tomatoes and peas on the west coast of Mexico and to melons in the Imperial Valley in California during the season of 1925–26. It was thoroughly demonstrated on the west coast of Mexico that large areas of vegetable crops can be economically treated with insecticides and fungicides under conditions making the successful operation of ground machinery impossible. It was found that from 8 to 10 ft. was the best height for the plane to travel above the tops of the tomato vines, and that calcium arsenate could be effectively distributed for a distance of about 150 ft., or 75 ft. on each side of the plane.

The ecology of parasites, A. S. Pearse (*Ecology*, *7* (*1926*), *No. 2*, *pp. 113–119*, *fig. 1*).—A brief discussion presented as the presidential address before the Ecological Society of America, at Kansas City, in December, 1925.

Entomology: Programme of research with brief progress reports (*East Malling* [*Kent*] *Research Sta. Ann. Rpt. 1924*, *pp. 139–166*, *pls. 2*).—Papers here presented include the following: The Study of Resistance of Various Apple Stocks to Attacks of Certain Insect Pests (pp. 139–142), Preliminary Field Trials of Tar Distillate Washes (pp. 143, 144), and The Control of the Apple Blossom Weevil, Anthonomus pomorum L., Curt. (pp. 145–157), previously noted from another source (E. S. R., 53, p. 558), all by a A. M. Massee; The Control of Big Bud Mite in the Field, by R. G. Hatton, J. Amos, and H. M. Tydeman (pp. 158–164); and Specimens and Pests Received during the Year, by A. M. Massee (pp. 165, 166).

Report of the chief entomologist for the year 1925, R. W. Jack (*South Rhodesia Dept. Agr. Rpt. Sec. 1925*, *pp. 19–23*).—The work of the year is considered under the headings of pests of citrus fruits, cotton pests, medical and veterinary entomology, mosquitoes, bloodsucking midges, etc.

Two important enemies of bluegrass pastures, H. Garman (*Kentucky Sta. Bul. 265* (*1926*), *pp. 31–47*, *figs. 4*).—The first part of this bulletin (pp. 31–44) deals with the blue-grass plant bug, officially known as the meadow plant bug. It was first observed in blue-grass Kentucky in 1908, and gradually increased in numbers until in 1924 the pest drew the attention of seed handlers and stockmen. It became evident that year that it is capable of ruining the seed crop. A study of its life history shows that it does much damage when the seeds are immature. It does no harm after the crop is stripped, remaining in the egg stage in the old grass stems during the summer and the following winter. It hatches in greatest numbers among blue grass that has not been closely grazed by stock, along fences both inside and outside of pastures and by roadsides where stock is not permitted to roam. In Kentucky the author found it to place its eggs only in blue-grass stems, but observations made in Maine indicate that it also utilizes the stems of timothy and other grasses. It is believed that getting rid of old growths of stems by any practical means will reduce the injury, and close grazing at all times in infested pastures is the most practical means for accomplishing this end.

The second part (pp. 44–47) deals briefly with the spring grain aphid or green bug (*Toxoptera graminum*), which was found in April, 1925, to be present in large numbers in and about blue grass and associated with the meadow plant bug. By May they had completely disappeared from the pastures, not merely by migrating to other host plants, but many having been killed by a parasitic fungus (*Empusa* sp.), lady beetles (*Hippodamia parenthesis*), and syrphus fly larvae.

Notes on the insect pests of red clover in mid and west Wales, J. R. W. Jenkins (*Welsh Jour. Agr.*, *2* (*1926*), *pp. 221–228*, *pl. 1*).—The author gives a

list of the more important and commonly occurring insect pests of red clover in mid and west Wales, together with a brief account of the damage caused by each pest. Investigations conducted showed that insect attack on red clover in the seedling stage results in a lowering of the plants' vitality and consequent reduction in the first year's yield.

Insect pests of cotton in New South Wales, W. R. Gurney (*Agr. Gaz. N. S. Wales, 34 (1923), No. 12, pp. 887–893, figs. 7; 35 (1924), Nos. 1, pp. 49–55, figs. 7; 2, pp. 137, 138, figs. 3; 6, pp. 422–428, figs. 4*).—This is a summary of information on the insects attacking cotton, together with control measures.

Notes on insects feeding on hops in 1925, F. V. Theobald (*Entomologist, 59 (1926), No. 756, pp. 129, 130*).—Notes are presented on the occurrence of *Macrosiphum gei* Koch, the hop aphid, *Myzus chelidonii* (Kalt.), *Typhlocyba lethierryi* Edw., *Euacanthus interruptus* L., *Calocoris fulvomaculatus, Vanessa io*, and several tortricids, particularly *Cacoecia rosana* and *C. podana*, etc.

Biological notes on important Opuntia insects of the United States, J. C. Hamlin (*Pan-Pacific Ent., 2 (1926), No. 3, pp. 97–105*).—This paper supplements an earlier account by the author (E. S. R., 54, p. 755). A report is given of studies of *Mimorista flavidissimalis* Grt., a species attacking the new growth; the cottony cochineal insects *Dactylopius tomentosus* Lmrk. and *D. confusus* Ckll.; *Asphondylia opuntiae* Felt, a species inhibiting the development of seeds; and of *Moneilema crassa* Le C., an Opuntia longicorn.

Diocalandra taitensis (Guerin) and other coconut pests of Fanning and Washington Islands, W. B. Herms (*Philippine Jour. Sci., 30 (1926), No. 2, pp. 243–274, pls. 8, figs. 3*).—The author reports that the pests of the coco palm on Fanning and Washington Islands include rats (*Epimys alexandrinus*), which gnaw young nuts and the bases of spikelets; robber crabs (*Birgus latro*), almost extinct on Fanning; fern scale, well parasitized by *Aspidiotiphagus citrinus*; mealybugs (*Pseudococcus pandani*), not abundant; caterpillars, belonging to two species not identified, particularly damaging to very young trees; *Xyleborus confusus*, a shot-hole borer, in old fallen nuts in particular; and the lesser coconut borer (*Diocalandra taitensis*), the most important of all.

"The larva of *D. taitensis* bores into the healthy plant tissue, attacking fronds, trunks, spikes, spikelets, and young nuts. Trees from about three years of age to very old ones are attacked by the beetles, the greatest amount of damage being done to trees which have recently come into bearing, and here the damage consists primarily in the loss of nuts through bored spikes and spikelets. A combined Diocalandra and caterpillar attack will cause young trees to become badly twisted and stunted, and death may ensue."

Since the usual methods of insect control can not be applied economically, it is recommended that frequent inspections be made and badly infested young trees be cut down and burned, as well as badly infested fronds, and that a determined effort be made to locate a parasite that will prey effectively on *D. taitensis*, preferably on the egg or the adult.

The engineer and the prevention of malaria, H. Home (*London: Chapman & Hall, 1926, pp. X+176, pls. 14, figs. 30*).—A practical discussion of this subject, including a final chapter on biological means of attack (pp. 123–132) and appendixes dealing with Mosquito Netting, by W. P. MacArthur (pp. 133–151); Applied Entomology (pp. 152–158) and House Flies (pp. 159–162), both by P. A. Buxton; and Water (pp. 163–172).

Clinical observations on endemic typhus (Brill's disease) in southern United States, K. F. Maxcy (*Pub. Health Rpts. [U. S.], 41 (1926), No. 25, pp. 1213–1220, pl. 1*).—The author points out that the epidemiology of the disease observed in the southern United States presents certain differences from that

of Old World typhus which suggest that the mode of transmission may not be the same, and that there may be some mode other than direct transmission from man to man by means of the bite of a louse. This conclusion follows a clinical description of endemic typhus based upon 114 cases observed in the southern United States.

The spotted locust, Aularches miliaris L., J. C. HUTSON (*Ceylon Dept. Agr. Yearbook, 1926, pp. 36–44, pl. 1*).—An account of the life history, habits, and means of control of this grasshopper, which has been known in Ceylon for a long time as a pest of miscellaneous crops.

The actual status of organization for combating the migratory locust in various countries, compiled by G. TRINCHIERI ET AL. (*Etat Actuel de l'Organisation de la Lutte Contre les Sauterelles dans Divers Pays. Rome: Inst. Internatl. Agr., Bur. Renseig. Agr., 1926, pp. 131*).—A review of the control work in various countries, which supplements the report of the proceedings of the international conference held at Rome in 1920 (E. S. R., 46, p. 853).

A revision of the American lice of the genus Pediculus, together with a consideration of the significance of their geographical and host distribution, H. E. EWING (*U. S. Natl. Mus. Proc., 68 (1926), Art. 19, pp. 30, pls. 3, figs. 8*).—The author recognizes two distinct groups of Pediculus as occurring in America. One is confined to monkeys, to which he recognizes four species as belonging, two of which are described as new. The other is confined to man, to which he recognizes five varieties as belonging, one of which is described as new.

The cicadas or harvest flies of New Jersey, W. T. DAVIS (*N. J. Dept. Agr. Circ. 97 (1926), pp. 27, figs. 15*).—The author presents a table for the separation of the genera and species of New Jersey cicadas, followed by brief accounts of the 11 forms occurring in the State.

Revision of the American leaf hoppers of the jassid genus Typhlocyba, W. L. MCATEE (*U. S. Natl. Mus. Proc., 68 (1926), Art. 18, pp. 47, pls. 6*).—The author recognizes 59 forms belonging to the genus Typhlocyba, of which 38 are described as new.

Studies on leafhopper injury to apple leaves, A. A. GRANOVSKY (*Phytopathology, 16 (1926), No. 6, pp. 413–422, pl. 1*).—This is a report of studies made at the Wisconsin Experiment Station of the cause of a peculiar yellowing of the marginal areas of apple leaves, commonly occurring during the past three years in many orchards at Sturgeon Bay and other points of the peninsular region of the State.

Feeding experiments indicate that the potato leafhopper, *Empoasca fabae* (Har.), is not only able to produce the symptoms of the disease, but prolonged confinement of the insects on apple leaves intensifies the symptoms. The symptoms are distinct from the ordinary feeding injury caused by leafhoppers, which is characterized by the downward curling of the lower surface of the leaves, always rolled in, without the marginal discoloration along the lateral veins. The apple hopperburn, on the other hand, is characterized by a marginal yellow discoloration of the leaves which moves progressively downward along the lateral veinlets and midrib. It is invariably more rapid in its development on the proximal side of the lateral veins than on the distal in reference to the petiole of the leaf. In cases of severe injury, the apical margins of the leaves turn brown and often curl upward.

These symptoms, observed on apple leaves, strongly resemble the hopperburn of potato, suggesting the existence of some toxic or specific infective principle within the insect. This specific infective principle moves downward in vascular bundles, discoloring the veins, but is localized in the leaves sub-

jected to leafhopper feeding. The symptoms can be produced artificially by needle inoculations with inoculum prepared from macerated adults and advanced nymphal stages of the insect. Crushing the nymphs and adults on apple leaves resulted in a smaller percentage of infection. The sap of affected leaves gives only a very small number of infections, probably due to the crudeness of inoculation technique and to dilution of the infective principle in the sap of the plant. The definite association of certain species of leafhoppers with the symptoms, the progressive downward movement of symptoms in the vascular system, and the artificial production of symptoms with inocula prepared from the insects and affected leaves indicate that the insect in question is a carrier of some specific infective principle, possibly a virus, in nature. The leafhoppers may be looked upon as a major factor in dissemination and transmission of important virus diseases of plants.

Cotton flea in the South, C. A. Whittle (*Manfrs. Rec., 90 (1926), No. 8, pp. 74, 75*).—The cotton flea is said to have appeared in 1926 in damaging numbers over a wider territory than ever before known. This was due, it is thought, to climatic conditions that favored a large survival over the winter, and to the presence of early host plants in great profusion, such as evening primrose, croton, and horsemint, on which plants the insects feed and breed in late winter and early spring. It is pointed out that, when some of these early host plants matured and died down, their flea population migrated to the cotton plants and there resumed feeding and breeding.

Notes on the English and American races of the greenhouse white-fly (Trialeurodes vaporariorum), F. Schrader (*Ann. Appl. Biol., 13 (1926), No. 2, pp. 189–196, figs. 5*).—The author's studies indicate that the American race of greenhouse whitefly is spreading rapidly to all places where it was formerly unknown, which seems to show that it reproduces at a greater rate or is more resistant to detrimental environmental factors than the English race.

Another year's experience with citrus aphis: New ways to combat this damaging pest, J. R. Watson (*Fla. Grower, 34 (1926), No. 1, p. 7*).—In this contribution from the Florida Experiment Station, the author reports that the damage caused by the citrus aphid during 1926 has been less than 10 per cent of that of the preceding year. He points out that the vast majority of aphids that go through the winter do so as adults on citrus, and that spirea and other host plants are of minor importance. The author has never found an egg nor an egg-laying aphid on citrus, the latter being of a bright yellow color, very different from the stem mothers which bring forth their young alive. Methods of control, dusting under tents, and natural enemies are considered.

The control of aphides infesting bulbs in store, R. Stenton (*Jour. Min. Agr. [Gt. Brit.], 32 (1926), No. 11, pp. 1037–1041*).—This account relates to the control of *Anuraphis tulipae* B. de F. in the storage warehouse, the life history of which is still somewhat obscure.

The primary food plant of the melon aphid, E. M. Patch (*Science, 62 (1925), No. 1614, p. 510*).—The author records finding that the primary food plant of *Aphis gossypii* is *Sedum telephium*, from which it migrates to its various summer food plants. See also a previous note (E. S. R., 55, p. 153).

Recent insecticide experiments in Illinois with lubricating oil emulsions, S. C. Chandler, W. P. Flint, and L. L. Huber (*Ill. Nat. Hist. Survey Bul., 16 (1926), Art. 2, pp. 101–126, figs. 2*).—The authors report upon the results of four years' experiments on the control of the San Jose scale at various points in southern Illinois. The superiority of oil sprays over lime sulfur was demonstrated, 11 per cent of the scale remaining alive after being hit with lime sulfur as compared with less than 2 per cent with most of the oil sprays. Boiled

emulsion was as effective as the various miscible oils used, and cold-mixed oil emulsions were about equally as effective but somewhat more unstable. The boiled soap emulsions are considered the most reliable type of homemade emulsions.

Vegetable oil soap was as effective as fish oil soap in making the boiled emulsions. Emulsions made from oils with viscosities below 80 have not shown uniformly good kill of scale. There were apparently no differences in effectiveness on San Jose scale in emulsions made from oils of 90 to 220 viscosity. Tests with boiled potash fish oil soap emulsions in summer showed very little injury to apple foliage, but considerable injury to peach and a few other plants under some conditions. Due to the difficulty in reaching the scale when the trees are in foliage, summer sprays are not recommended except in case of very severe scale infestation. Where oil emulsions were properly mixed and applied, no injury to trees has resulted.

Non-inflammable fumigant for use against wax moth (Galleria mellonella L.), R. Hutson (*Amer. Bee Jour., 66 (1926), No. 6, pp. 273, 274*).—In this contribution from the New Jersey Experiment Stations, the author calls attention to the fact that ethyl acetate with carbon tetrachloride, in the proportion of 30 lbs. or more to 1,000 cu. ft., will kill larvae and pupae of the wax moth if exposed for 48 hours at temperatures of from 60 to 85° F.

The small tussock moth (Notolophus posticus Wlk.), a pest on dadap (Erythrina lithosperma Bl.), E. de Alwis (*Ceylon Dept. Agr. Yearbook, 1926, pp. 19–21, pl. 1*).—A general account of this species, the life history of which has not hitherto been worked out in detail under Ceylon conditions. A tachinid fly, *Tricholyga sorbillans* W., is an important parasite of the pest.

A three-year study of the codling moth with particular reference to "side worm" injury, A. I. Bourne (*Mass. Fruit Growers' Assoc. Rpt., 32 (1926), pp. 181–190*).—The data here presented have been noted from another source (E. S. R., 55, p. 256).

Oil spray for codling moth tested, A. F. Dever (*Better Fruit, 20 (1926), No. 12, p. 7*).—The author reports on tests made of oil in an old Spitzenberg orchard, with and without spreader and in strengths varying from 0.5 to 1 per cent, to 1.5 per cent. The results indicate that 1.5 per cent oil spray is effective as an ovicide and an insecticide at any stage from fresh eggs to hatched larvae. It is pointed out that the degree of control attained is based not so much on whether the application is 1 or 1.5 per cent in the tank, but upon the amount of solution that is applied to the fruit.

How to fight the European corn borer this fall, D. J. Caffrey and L. H. Worthley (*U. S. Dept. Agr., Misc. Circ. 84 (1926), pp. 4, fig. 1*).—A practical account.

Some factors responsible for the decrease of the European corn borer in New England during 1923 and 1924, G. W. Barber (*Ecology, 7 (1926), No. 2, pp. 143–162, figs. 2*).—In this continuation of the author's investigations of the European corn borer for the U. S. D. A. Bureau of Entomology (E. S. R., 53, pp. 256, 653, 757; 54, p. 157; 55, p. 762), it is pointed out that the decrease in its abundance in New England in 1923 and 1924 was probably caused by an association of factors, some of major importance and others contributory but increased in value through the effect of the major limiting factors.

Natural causes of decrease included heavy winds and rains, destroying some of the moths as well as preventing others from laying the normal number of eggs; low night temperatures, decreasing the number of eggs deposited, an important factor in 1923; drought, preventing some eggs from hatching; heavy rains, destroying larvae before they had bored in; certain individuals having only a single generation; the abundance of larvae that failed to attain full

growth before hibernation; winter mortality; birds feeding on moths, taking larvae from burrows in the growing plant, and feeding on overwintering larvae; mice feeding on overwintering larvae; predacious insects feeding on larvae, adults, and eggs; parasites destroying eggs, larvae, and pupae; and disease of larvae.

Of artificial control measures, burning the crop refuse containing larvae is considered to be the most effective, and to be rendered more so by plowing in the stubble to a depth of 6 in. or more. Feeding the infested cornstalks to cattle also destroys the larvae and fully utilizes the crop. Trap crops planted early, and also late planting of the main crop, decreases the extent of the infestation. The natural succession of vegetation sometimes greatly reduces the number of corn borers through weeds that are unavailable for food taking the place of suitable food species. Constant shifting in importance of the limiting factors, and new alignments, seem to cause the seasonal variation in population of the European corn borer.

The Hessian fly in Oregon, L. P. Rockwood (*Oregon Sta. Circ. 77 (1926), pp. 7, figs. 4*).—A practical account of this pest and means for its control in Oregon.

Substantial accomplishments in New Jersey mosquito control, T. J. Headlee (*New Jersey Stas. Bul. 437 (1926), pp. 8*).—A study was made of the tax valuations from 1900 to 1925 in 16 areas along the Atlantic Ocean and Delaware Bay coast to determine the effect of the antimosquito work done since 1915 upon property values. Yearly increases in tax valuations from 1916 to 1925 in 8 areas in which mosquitoes have been greatly reduced or practically eradicated were 1.7 times those from 1900 to 1915 as compared with 1.5 times for 1 area where mosquitoes have always been scarce, and 0.95 times for 7 areas in which mosquitoes have been and are still troublesome in varying degrees.

Destroying engorged Anopheles as a malaria control measure, J. A. Le Prince (*Pub. Health Rpts. [U. S.], 41 (1926), No. 25, pp. 1220–1226*).—Data are presented to show that the destruction of engorged Anopheles is an important means of combating malaria.

Relationship of plankton to anopheline larvae, L. T. Coggeshall (*Amer. Jour. Hyg., 6 (1926), No. 4, pp. 556–569*).—The author reports upon dissections of larvae made to determine whether the anopheline species exhibit preference for certain types of food. From the information gained it is evident that the three species examined, namely, *Anopheles quadrimaculatus* Say, *A. crucians* Say, and *A. punctipennis* Wied., show no discrimination in their selection of food.

Observations on the emergence of Anopheles mosquitoes, G. H. Bradley (*Amer. Jour. Trop. Med., 6 (1926), No. 4, pp. 283–297, figs. 3*).—This contribution from the U. S. D. A. Bureau of Entomology records the emergence of 585 adults from 904.9 sq. yds. of water surface in selected anopheline breeding areas.

The further development of Onchocerca volvulus Leuckart in Simulium damnosum Theob., D. B. Blacklock (*Ann. Trop. Med. and Parasitol., 20 (1926), No. 2, pp. 203–218, pl. 1, fig. 1*).—Experiments conducted, in continuation of those previously reported (E. S. R., 54, p. 773), showed that larvae of *O. volvulus* taken up from the skin by *S. damnosum* in biting undergo progressive development in the fly and finally reach the proboscis, the time taken to complete the development depending largely upon temperature. The shortest period which elapsed after feeding before the proboscis became infected was seven days. The mature larvae were found in the labium of the fly and

escaped through the membranous portion of it. It is concluded that, in so far as experiments with wild flies can be accepted as evidence in the absence of actual transmission to man or animal, *S. damnosum* is a vector of *O. volvulus*.

Leatherjackets and their control, H. W. Thompson (*Welsh Jour. Agr., 2 (1926) pp. 228–233*).—The author finds that naphthalene has some value as a deterrent against leatherjacket attack; that kainite has no insecticidal value and apparently no value as a deterrent against the pests; that sodium fluoride as a bait poison is not satisfactory, at least at the strength tested; and that Paris green is a satisfactory poison, and if carefully used should prove of considerable value as a control for leatherjackets.

Further experiments in the control of certain maggots attacking the roots of vegetables, K. M. Smith (*Ann. Appl. Biol., 12 (1925), No. 1, pp. 77–92*).—Experiments here reported, conducted in continuation of those previously noted (E. S. R., 48, pp. 157, 459), deal with the onion maggot, carrot rust fly, and cabbage maggot, maggot and the turnip gall weevil (*Ceuthorrhynchus pleurostigma* Marsh). Control experiments with the first two have been carried on since 1920, a list of all the chemicals used being given.

As a result of the 1924 experiments, nicotine sulfate dust in a 5 per cent mixture with precipitated chalk and chlorocresylic acid in a 1 per cent mixture with precipitated chalk are recommended for use against the onion maggot. After three seasons' trials, creosote is not considered an efficient remedy for this pest.

For the carrot rust fly nicotine sulfate dust in a 5 per cent mixture and creosote in a 1 per cent mixture, both in chalk, gave promising results in the 1924 trials.

Of chemicals used in field trials against the cabbage maggot, the most successful were (1) chlorocresylic acid, (2) green tar oil, and (3) creosote. Anthracene oil and nicotine sulfate also gave fair results. The results of a number of pot experiments designed to test the efficacy of corrosive sublimate as a control for the cabbage maggot do not appear to justify the use of this substance, but further trial is necessary.

In order to ascertain the effect of galls of the turnip gall weevil upon the health of the cabbage plant, 400 cabbages, 200 galled by the larvae and 200 healthy, were grown under test conditions. The results of this experiment indicate that the galls are attractive to slugs. The critical time in the life of a galled cabbage is the seedling stage, but given good cultural conditions at the time of setting out, the cabbage will flourish normally.

Studies of Oscinella frit L.: A preliminary investigation of the extent of the recovery power of oats when subject to injury, N. Cunliffe (*Ann. Appl. Biol., 12 (1925), No. 2, pp. 276–286*).—This is a report of investigations made during the summer of 1924 of the extent of the recovery power of oats after injury such as is inflicted by the larvae of *O. frit*.

Plague fleas, with special reference to the Milroy Lectures, 1924, L. F. Hirst (*Jour. Hyg. [London], 24 (1925), No. 1, pp. 1–16*).—This paper discusses the flea species factor, comparative experiments on the transmission of plague by rat fleas, factors governing distribution of rat fleas, *Xenopsylla cheopis* and imported plague, and distribution of *X. cheopis* and *X. astia* in relation to plague in Colombo.

False wireworms injurious to dry-farmed wheat and a method of combating them, C. Wakeland (*Idaho Sta. Research Bul. 6 (1926), pp. 3–52, figs. 24*).—This is an account especially of the life history, habits, and means of control of *Eleodes hispilabris* Say, the most important of 11 species and 15 varieties known to occur in Idaho. Its injury to dry-farmed wheat is caused by the destruction of the germ in planted kernels, the devouring of the sprout, or

the gnawing of the stem below the surface of the ground. The adults hibernate in protected places during the winter and emerge early in the spring, soon dispersing over cultivated fields. Eggs are deposited in late May and June in dry soil close to where it joins the moist subsoil. The average incubation period of eggs was found to be 14.91 days, the average larval period (11 instars) 369.19 days, the average pupal period 33.59 days, and the average complete life cycle 721.69 days.

Numerous laboratory and field tests showed arsenical poisons when combined with bran and moisture to be effective in killing Eleodes beetles. It was found that carefully and uniformly conducted poisoning for two consecutive seasons over an extensive area results in nearly complete destruction. Natural enemies are said to be of little importance, and cultural practices to be of little direct benefit as means of control.

A bibliography of 68 titles is given.

The tobacco flea-beetle, H. H. Jewett (*Kentucky Sta. Bul. 266 (1926), pp. 51–69, figs. 7*).—This is an account of studies of *Epitrix parvula*, including its life history and means of control. The author finds the incubation of the egg to last from 5 to 13 days, the larval stage from 13 to 29 days, and the pupal stage from 3 to 9 days—from 23 to 45 days being required for the completion of the life cycle. It was found that three broods may appear during the season. The beetle hibernates in the adult stage under loose litter or other materials near the plant beds or tobacco fields. A list of 33 references to the literature is included.

Notes on the life history and habits of the curry-leaf beetle, Silana farinosa Boh., F. D. Peries, jr. (*Ceylon Dept. Agr. Yearbook, 1926, pp. 51–54, pl. 1*).—The chrysomelid beetle here reported upon is said to damage the foliage of the curry-leaf tree (*Murraya koenigii* Spreg) in Peradeniya.

On the early stages of some weevils (Curculionidae), A. W. R. Roberts (*Ann. Appl. Biol., 13 (1926), No. 2, pp. 197–218, figs. 24*).—The species dealt with are *Phyllobius urticae* Deg., *P. pyri* L., and *Polydrusus cervinus* L.

Report of the Maryland State Beekeepers' Association (*Md. Agr. Soc., Farm Bur. Fed., Rpt., 10 (1925), pp. 332–367*).—This is a report of the proceedings of the seventeenth annual meeting of the association, held at Baltimore, in January, 1926. Among the papers presented are the following: The Life-Sustaining Value, for Honeybee Larvae, of Various Carbohydrates and Honeys, by L. M. Bertholf (pp. 334–339); Keeping Bees in Outyards, by R. A. Nusbaum (pp. 340–345); *Braula coeca*, by W. J. Nolan (pp. 346–352); Producing Comb Honey That Can Be Graded, by E. L. Sechrist (pp. 353–361); and Fall Management, by J. E. Eckert (pp. 361–367).

In experimental work conducted by Bertholf at the Bee Culture Laboratory of the U. S. D. A. Bureau of Entomology, a comparative study was made of the value of various honeys as food for bees, including basswood, white clover, tulip tree, alfalfa, buckwheat, mountain laurel, sage, wild buckwheat, aster, goldenrod, and locust. A series was run in which lots were fed on all these honeys, on 75 per cent cane sugar, and on water. The various honeys were chosen with a view to securing the widest possible variation in source, color, dextrin content, dextrose-levulose ratio, tannin content, etc. For comparing with the various single carbohydrates used in this investigation, the lengths of life on all the honeys were averaged together and divided by the length of life of the water check to obtain the life-sustaining quotient. When the quotients obtained for each carbohydrate and for the honeys were all compared it was found that sucrose gave the highest quotient (7.4), and that next in order came levulose (4.7), maltose (4.3), melizitose (4.3), dextrose (3.9),

honeys (3.6), trehalose (3.0), dextrin (2.9), galactose (0.9), lactose (1.7), glycogen (1.0), and starch (0.9).

The life history of the saskatoon sawfly (Hoplocampa halcyon Norton), R. D. BIRD (*Sci. Agr., 6 (1926), No. 10, pp. 353–357, figs. 3*).—This is a report of life history studies of a sawfly which attacks the fruit of the saskatoon (*Amelanchier spicata*), which is probably used on the Canadian Prairies as a preserve more than any other native fruit with the exception of the raspberry. Technical descriptions of its life stages are included.

Miscellaneous new chalcid-flies of the hymenopterous family Encyrtidae, P. H. TIMBERLAKE (*U. S. Natl. Mus. Proc., 69 (1926), Art. 3, pp. 34, pls. 2, fig. 1*).—The author erects seven genera and describes nine species as new to science.

Biological investigations on the Hymenoptera of Chile: Mellifera [trans. title], F. CLAUDE-JOSEPH (*Ann. Sci. Nat., Zool., 10. ser., 9 (1926), No. 3–4, pp. 113–240, figs. 78*).—A report of studies of the bees of Chile.

The fern mite (Tarsonemus tepidariorum Warburton), W. P. L. CAMERON (*Ann. Appl. Biol., 12 (1925), No. 1, pp. 93–112, pls. 3, figs. 5*).—It is shown that the fern mite is of distinct economic importance, its attack being on the younger parts only of the fern (*Asplenium bulbiferum* and its varieties), causing the fronds to become distorted and the plant to be so dwarfed that it is unsalable.

"The disease spreads rapidly in a greenhouse due to the rapid multiplication of the mite and the very short life cycle of 17 days, on the average. All stages of the pest may be found during the summer, and the winter is passed mainly as an adult female, although a few eggs may also be found at that time. The mites spread from one nursery to another by the introduction of infested plants; from one plant to another by crawling from leaf to leaf where these touch, and probably by walking along the surface of the moist earth, and by the planting of young 'pips' taken from infested parents. The disease is difficult to control. Preventive measures offer more chance of success than do remedial. The young pips should be planted clean, and then kept free from the pest by means of deterrent sprays. The pips are treated with some insecticide before planting."

Tick destruction in Jamaica, H. H. COUSINS (*West Indian Agr. Conf., Kingston, Proc., 9 (1924), pp. 153–161, pl. 1*).—A discussion of the work under way.

A filter-passing virus obtained from Dermacentor andersoni, H. NOGUCHI (*Jour. Expt. Med., 44 (1926), No. 1, pp. 1–10, figs. 4*).—The author reports having isolated an invisible, filter-passing virus, pathogenic for the guinea pig and capable of cultivation on special media for at least seven generations. One of two rhesus monkeys inoculated became infected, and in one rabbit the result was negative. The virus was transmitted from infected guinea pigs to ticks, and in one instance by tick feeding from an infected tick to a guinea pig.

ANIMAL PRODUCTION

Diet in relation to reproduction and rearing of young.—I, II (*Amer. Jour. Physiol., 76 (1926), No. 2, pp. 325–338, 339–348*).—In the first paper, entitled Observations on the Existence of Vitamin E, V. E. Nelson, R. L. Jones, V. G. Heller, T. B. Parks, and E. I. Fulmer have presented the results of 8 different experiments in which the rate of reproduction and growth of rats on synthetic diets has been determined. The synthetic rations included casein, minerals, butterfat, yeast, and dextrin, and some contained lard. The amounts of certain ingredients were varied in the different experiments.

The results show that rats on rations containing 5 per cent of Fleischmann's yeast as the only source of vitamin B were carried through the sixth generation, but that the postnatal mortality was heavy. When lard was added in amounts varying from 7 to 25 per cent, and casein in amounts from 18 to 40 per cent, reproduction was much below normal. Animals were carried through the third generation on diets containing from 15 to 30 per cent of casein and 5 per cent of Fleischmann's yeast, although the mortality was also very high. Similar results were obtained with 5, 8, and 12 per cent of Harris' yeast and 18 per cent of casein. Undried yeast and larger amounts of butterfat were supplied in an effort to lower the mortality of the young without success. It was, however, noted that reproduction occurred in high butterfat diets but was prevented when equal amounts of lard were included in the ration. The results of 2 experiments showed that xerophthalmia developed on rations containing 5 per cent of butterfat and a high lard content, but this condition disappeared when the lard was replaced by dextrin. The authors believe that the lard causes the destruction of the fat-soluble vitamin.

It is concluded that "the failure of these diets for reproduction and rearing of young is not due to a deficiency of fat-soluble vitamins, but may be due to an insufficiency of vitamin B and an inadequate quantitative relation between the known constituents of the diet."

In the second paper the results of experiments with rats which were conducted to determine the vitamin B content of white and yellow corn, wheat, barley, and rye, and the efficiency of these sources of vitamin B for growth, reproduction, and rearing of young are reported by A. E. Guest, V. E. Nelson, T. B. Parks, and E. I. Fulmer. The rations consisted of 18 per cent of casein, 3.7 per cent of minerals, 5 per cent of butterfat, 10 to 60 per cent of the seeds, and the balance of dextrin. The rats weighed from 50 to 60 gm. at the beginning of the experiment. Growth records were obtained through the second generation except on the barley ration. The results are tabulated showing the numbers of young produced and reared on each ration and the relative growth curves.

More litters were produced when the seeds formed the only source of vitamin B than in the above experiment when yeast was used. The mortality of the young and the number of females dying during pregnancy and parturition were, however, very high on many of the diets.

In discussing the results it is pointed out that the high mortality is not due to a deficiency of fat-soluble vitamins. It is also noted that young were produced when the rations contained insufficient vitamin B for normal growth. It is concluded therefore that the requirement of vitamin B for reproduction is less than that for growth, but approximately 50 per cent more vitamin B is required for normal reproduction than for normal growth. The inability to rear young is associated with the lack of milk secretion, for which the vitamin B requirement appears to be very high.

Fertility of the white rat on purified rations, A. L. DANIELS and M. K. HUTTON (*Soc. Expt. Biol. and Med. Proc., 23 (1925), No. 3, pp. 225-227*).—In studies at the University of Iowa of the factors which limit normal reproduction on purified rations, it was found that supplementing a milk diet with the ash of soy beans, lettuce, and yeast in amounts equal to that in quantity of the nonincinerated substances which overcame sterility on milk diets resulted in the birth of normal young. On the other hand, animals failed to reproduce when the purified diets were supplemented with the different sources of ash, but when the purified rations were supplemented with various substances containing vitamin E normal reproduction occured. It is therefore concluded

that milk is lacking in minerals rather than in vitamins for reproduction, while the purified ration was deficient in this vitamin. Since much better growth was obtained in these experiments when yeast was used as the source of vitamin B in a purified ration than when an alcoholic extract of wheat embryo was used, it is assumed that yeast contains the essential inorganic substances.

Studies on the physiology of reproduction in birds.—XXI, Blood calcium changes in the reproductive cycle, O. Riddle and W. H. Reinhart (*Amer. Jour. Physiol., 76 (1926), No. 3, pp. 660–676, figs. 4*).—In studies at the Carnegie Station for Experimental Evolution, determinations have been made of the calcium content of the blood of 191 healthy adult male and female ring doves and common pigeons and of 47 ring doves, common pigeons, and generic hybrids from 3 to 6 months of age. The two species were very similar in the calcium content of the blood, and the results were, therefore, combined and grouped according to sex and 13 stages of the females' reproductive cycle.

The blood of the males was practically constant at all stages, containing approximately 9 mg. of calcium per 100 cc. The calcium in the blood of the females varied with relation to the time of ovulation. In the nonovulation stages the amount of calcium in the blood was very similar to that of the males, but it began to increase during the period 73 to 108 hours before ovulation and reached a maximum during the 44-hour period of ovulation of more than double the amount present in the resting stage of the reproductive cycle. It dropped rapidly to normal within the next 108 hours. No difference in the calcium in the blood of the two sexes was observed in the immature birds, but there appeared to be a distinct increase during both the spring and summer months as compared with winter. The seasons of high blood calcium correspond to the season of small size of thyroids and large size of testicles and ovaries. The occurrence of certain irregularities in the amount of blood calcium of individuals is noted.

The increases in the blood calcium associated with ovulation are discussed in relation to the reproductive cycle of mammals and the influence of the parathyroid glands, from which it appears that the latter play an important part in reproduction, especially in relation to the experimental modification of sex.

The effect of gonadectomy on the weight of the kidney, thymus, and spleen of mice, K. Masui and Y. Tamura (*Brit. Jour. Expt. Biol., 3 (1926), No. 3, pp. 207–223, figs. 8*).—The body weights and lengths and the weights of the kidneys, thymus, and spleen of normal and castrated mice were obtained for a study of the effects of sex and gonadectomy on these characters at the University of Tokyo. In the investigation litters were divided into two groups, one group of which was gonadectomized at 20 days of age. There were between 100 and 200 individuals in each group, and all were killed when 90 days of age The data are summarized in the following table:

Effect of sex and gonadectomy on the size of the body and the organs of mice

Sex	Body weight	Body length	Kidney weight	Thymus weight	Spleen weight
	Grams	*Centimeters*	*Grams*	*Grams*	*Grams*
Males	22.70±0.09	6.065±0.007	0.416±0.003	0.021±0.0004	0.061±0.002
Females	21.11± .19	6.156± .018	.289± .002	.038± .0007	.134± .006
Castrated males	22.99± .13	6.198± .006	.274± .002	.052± .0007	.125± .003
Castrated females	22.66± .24	6,134± .017	.266± .002	.051± .0005	.129± .005

The results showed that there were distinct sexual differences in the weights of the body, kidney, thymus, and spleen, and a slight difference in body length.

The removal of the male gonads caused the weight of the kidney, thymus, and spleen to approach that of the female type, while there was little or no effect from gonadectomy on the weight of these organs in the female. The body weight of the male showed no change after castration, while that of the female increased quite rapidly after spaying.

On the migration of ova from one uterine horn to the other in the albino rat; and some evidence indicating a new ovarian hormone, F. B. Hanson and C. Boone (*Amer. Nat., 60 (1926), No. 668, pp. 257–265*).—In one experiment 20 female rats were semispayed, part on one side and part on the other, to study the migration of ova from one horn of the uterus to the other. The females were bred after recovery and killed prior to parturition. No embryos were found implanted on the uterine horn of the side from which the ovary was removed, indicating that crossing over does not occur in the albino rat. The average size of the litters produced was 5.70±0.24, which was quite comparable to the size of litters of the control stock. The one ovary had thus produced as large litters as two.

In further studying the factors responsible for the production by semispayed rats of as large litters as normals, a portion of one oviduct of 14 females was excised and the ends were tied. A total of 45 litters were produced by these females, of which the average size was 3.80±0.156. The difference between the litter size of semispayed individuals and those having a portion of one oviduct excised was 1.90±0.29. In explaining the differences it is suggested that there is a reciprocal hormone relationship between the two ovaries, each tending to suppress the other, but that when one ovary is removed the other hypertrophies and produces larger numbers of ova.

The coat of the mouse (Mus musculus), F. W. Dry (*Jour. Genetics, 16 (1926), No. 3, pp. 287–340, pls. 4, figs. 103*).—This paper presents the results of microscopic studies of the types and development of hair found in the mouse. The specimens studied were mainly taken from the mid-dorsal line, but hair from other portions of the skin was also examined for comparison. It was found that the hairs were grown in distinct generations on the main areas, but that there was considerable variation in the succession of hairs in isolated follicles.

The nutritive value of various layers of the wheat and corn kernel, A. Klein, B. Harrow, L. Pine, and C. Funk (*Amer. Jour. Physiol., 76 (1926), No. 2, pp. 237–246, fig. 1*).—Data are presented dealing with the nutritive value of the proteins in corn meal, corn feed meal, wheat bran, standard wheat middlings, red dog flour, and the first clear, second clear, and patent flours, as determined by chemical fractionation of the proteins and by feeding experiments with rats.

The results show that much difference exists in the nutritive properties of the different layers, but those parts containing the bulk of the vitamins also have proteins of high biological value. The milling fraction, red dog flour, gives the best combinations of the highest biological value, together with the highest general dietetic value. The corn feed meal was superior to corn meal. The possibility of certain vitamins increasing the biological value of the proteins is suggested.

Cottonseed products as feed, fertilizer, and human food (*Texas Sta. Bul. 341 (1926), pp. 5–28*).—This bulletin discusses briefly the properties and composition of cottonseed meal and hulls, together with directions for feeding these products to the various classes of animals and suggested rations for each, and information as to cottonseed meal as a fertilizer, noted on page 22 and as to cottonseed flour as a human food.

Feeding experiments with pineapple bran at the University of Hawaii (*Hawaii Univ. Quart. Bul., 4 (1926), No. 4, pp. 27-32*).—A ration of one-third each of barley, wheat bran, and pineapple bran was fed to 3 grade Percheron horses for 18 months with excellent results.

When 2 purebred Berkshire and 2 crossbred (Tamworth × Berkshire) pigs were given free access to a mixture of pineapple bran, wheat middlings, coconut meal, and tankage (5:3:1:1), together with 0.5 lb. of green alfalfa daily during the 12 weeks following weaning, the purebred Berkshires made an average daily gain of 0.96 lb. and the crossbreds 1.13 lbs. An average of 3.43 lbs. of grain was required per pound of gain.

Two lots of 4 crossbred (Tamworth × Berkshire) pigs each were also fed during an 84-day period on rations containing 50 and 60 per cent pineapple bran. The other feeds included wheat middlings, coconut oil cake meal, tankage, salt, and raw rock phosphate. During the test period an average daily gain of 1.08 lbs. was made on the 50 per cent pineapple bran mixture and 0.72 on the 60 per cent pineapple bran mixture. The two lots required 4.59 and 4.96 lbs. of grain, respectively, to produce 1 lb. of gain. The results indicate that the 50 per cent pineapple bran mixture is superior to the mixture containing the larger amount of this feed.

Straw hydrolyzation with special regard to the significance and profit from the process, as well as analytical-chemical and microchemical investigations [trans. title], J. Schiele (*Landw. Jahrb. Bayern, 16 (1926), No. 1-3, pp. 93-109, figs. 2*).—This deals with the hydrolyzation of straw, reviewing the historical development of the methods of treatment and describing the chemical, microscopical, and anatomical make-up of straw, the different methods of hydrolization, and their effect on the resulting product.

Commercial feeding stuffs, 1925-1926, J. M. Bartlett (*Maine Sta. Off. Insp. 120 (1926), pp. 33-52*).—This gives the guaranties and analyses of the samples of feeding stuffs officially inspected during the year ended June 30, 1926 (E. S. R., 54, p. 758).

Analyses of mixed feeds on sale in North Carolina, 1924, J. O. Halverson and L. M. Nixon (*N. C. Dept. Agr. Bul., 1925, Sept., pp. 51, fig. 1*).—This reports the guaranties and analyses of feeding stuffs officially inspected in North Carolina during the year 1924, and includes miscellaneous information related to feeding.

Inspection of feeds, J. B. Smith and L. J. Hardin (*Rhode Island Sta. Ann. Feed Insp. Circ., 1926, pp. 8*).—The guaranties and analyses for protein and fat are presented for the feeds officially analyzed during the season of 1925-26, with suggestions for calculating the relative value of the feeds (E. S. R., 53, p. 465).

Feeding stuffs, F. T. Shutt (*Canada Expt. Farms, Div. Chem. Rpt. 1925, pp. 25-34*).—This reports chemical analyses of samples of various feeding stuffs which have been studied by the division of chemistry.

The feeding of domestic animals, N. Hansson, trans. by F. von Meissner (*Fütterung der Haustiere. Dresden: Theodor Steinkopff, 1926, pp. XII+230, figs. 7*).—The book is divided into three parts, dealing with the principles of animal nutrition and giving descriptions of various individual feeds and the nutrient requirements of the various classes of farm animals.

Proceedings of the twenty-eighth [and twenty-ninth annual conventions] of the American National Live Stock Association (*Amer. Natl. Live Stock Assoc. Proc., 28 (1925), pp. 132, pls. 8, figs. 4; 29 (1926), pp. 150, pls. 7*).—These are the usual reports of the meetings of this association (E. S. R., 53,

p. 167), held at Albuquerque, N. Mex., in January, 1925, and at Phoenix, Ariz. in January, 1926.

Proceedings of the twenty-first annual convention of the Corn Belt Meat Producers' Association and of the fifth annual convention of Iowa Cooperative Livestock Shippers (*Corn Belt Meat Prod. Assoc. [etc.] Proc., 21 (1924), pp. 70*).—This consists mainly of papers of popular interest as in previous reports (E. S. R., 52, p. 168).

Horse and cattle production in the Dutch East Indies [trans. title], J Merkens (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Veeartsenijk Meded., No. 51 (1926), pp. VIII+252, pls. 44*).—Descriptions are given of the many different breeds and types of horses and cattle in the Dutch East Indies, including accounts of the measures taken for the improvement of horses and cattle through breeding.

A quarterly bulletin on the condition of range, water, and cattle throughout New Mexico (*N. Mex. Cattle and Horse Growers' Assoc. Quart. Bul. 13 (1926), pp. [32], fig. 1*).—This publication deals in general with range legislation and statistics of cattle production, but includes other information of popular interest to New Mexico livestock producers.

Shipping cattle to Britain (*Canada Dept. Agr. Bul. 62, n. ser. (1926), pp. 51*).—This gives complete accounts of six experimental shipments of beef cattle to Great Britain, the last of which was made in April, 1925. The results of the individual experimental shipments have been briefly noted from the reports of the experimental farms (E. S. R., 55, p. 358).

The general results have indicated that the shipping of chilled beef to Great Britain is unprofitable, but that the popularity of Canadian store cattle is increasing in the British market and the enterprise is profitable provided suitable grades of animals are shipped at the proper time and under the proper conditions. The British prefer the younger steers of good quality, 1,100 to 1,200 lbs. being the most desirable weight. Older cattle must be better finished than younger cattle, since the former are ordinarily slaughtered immediately. Any of the three major beef breeds, Aberdeen Angus, Hereford, or Shorthorn, purebreds or grades, are acceptable, but the Herefords should be shipped in time for finishing on grass.

The importance of uniformity in the shipments is emphasized. It is suggested that individuals may ship either through exporters or cooperatively. The facilities available at the three major markets, Glasgow, Liverpool, and Manchester, are briefly summarized.

Results of experiments in breeding for fleece improvement, [D. A. Spencer] (*Natl. Wool Grower, 16 (1926), No. 4, pp. 25–28, figs. 8*).—The relation of various factors to the scoured fleece weights of individual ewes has been studied from the records of 1,496 Rambouillet fleeces sheared during the years 1921, 1923, and 1924, at the Sheep Experiment Station, Dubois, Idaho. The fleece weights were found to increase with the age of the ewes from yearlings to 3-year-olds and then in general to decrease as age advanced.

The length of staple was one of the most important factors as related to heavy fleece weight, although density was also of considerable importance. There was, however, a slight negligible relation between length of staple and density. Fineness of fleece and large amounts of dirt were related to smaller weights of scoured fleece. Studies of the effect of percentage of grease gave somewhat variable results, but indicated that fleece should not be overloaded with grease for the maximum scoured weights.

Studies of the average percentages of clean wool, grease, and dirt in various parts of 50 of the fleeces showed that the necks yielded the highest percentage

of clean wool and the lowest percentage of dirt, while the reverse was the case with the bellies. Both the necks and bellies contained 13 per cent of grease, and the sides, backs, and rumps 15 per cent each. Grease appears to be the most constant of the three factors in different parts of the fleece.

Are twin lambs desirable? W. E. JOSEPH (*Natl. Wool Grower, 16 (1926), No. 4, pp. 19–21, figs. 4*).—From records of approximately 300 fine-wool ewes, 2, 3, and 4 years of age, bred and raised on the range at the Montana Experiment Station, the desirability of single and twin lambs has been compared in the lambing seasons of 1923, 1924, and 1925. The results showed that during 1923 the 13 pairs of twin lambs born in May averaged 95.8 lbs. in weight in October as compared with 60.4 lbs. for the single lambs of other ewes. Similar or somewhat more favorable results were shown for the twins born in 1924 and 1925. The averages for the twin pairs in the two years were 119.5 and 112.8 lbs. of lamb per ewe as compared with 72.8 and 71.5 lbs. of lamb per ewe for those producing singles in the respective years.

The ewes which raised twins did not show any reduction in their ability to raise lambs in the suceeeding year.

The average weights of lambs born as twins but raised as singles were compared with the average weights of singles, and it was found that the handicap of being born as one of twins only amounted to 2 or 3 lbs.

The British Goat Society's year book for 1926, compiled by T. W. PALMER (*London: Brit. Goat Soc., 1926, pp. 163, pls. 34*).—This is the sixth yearbook of the British Goat Society, containing numerous articles of popular interest similar to those of a previous number (E. S. R., 54, p. 466).

The fattening of pigs (*North. Ireland Min. Agr. Leaflet 35 (1926), pp. 10*).—This deals with the principles of feeding and fattening pigs, including several rations suggested for different ages.

Brood sow and litter, L. A. WEAVER (*Missouri Agr. Col. Ext. Circ. 172 (1926), pp. 11, figs. 4*).—This circular gives brief popular directions for the care, management, and feeding of the brood sow and her litter.

Studies on the sex-ratio and related phenomena.—VIII, The seasonal sex-ratio in the pig, A. S. PARKES (*Ztschr. Induktive Abstam. u. Vererbungslehre, 40 (1926), No. 3, pp. 121–138, fig. 1*).—In continuing this series (E. S. R., 55, p. 635) it was found that the numbers of individuals, litters, and sex ratios given for the pigs recorded in the National Duroc-Jersey Record, vol. 67, as born during the four quarters of the year, i. e., September, October, and November; December, January, and February; March, April, and May; and June, July, and August were respectively 19, 10.3, 56, and 14.7. The average litter size and the sex ratios were relatively constant, the extremes for the average size of litter in the different quarters being 8.04 and 8.31, and for the sex ratios 46.1 and 44.4 per cent.

Other data on seasonal variations in the sex ratios of man and animals are discussed, from which it is concluded that seasonal variations are apparent under the more primitive conditions of breeding.

Sugar beet tops as a substitute for oats in the feeding of heavy draft horses [trans. title], E. BARTSCH (*Landw. Jahrb., 63 (1926), No. 2, pp. 157–206, pl. 1*).—The results of an experiment are reported in which one horse of each of three teams received during the period October 1 to November 17 a daily ration per 600 kg. of live weight of 5 kg. of rye straw, 5 kg. of meadow hay, and 7.5 kg. of oats, as compared with 5 kg. of rye straw, 7 kg. of alfalfa hay, 3.5 kg. of oats, and 25 kg. of sugar-beet tops without leaves for the other horse of each team. The amount of work done and the weights of the horses taken at different intervals were used for determining the value of the sugar beets as a partial substitute for oats.

During the experiment the horses receiving oats lost a total of 5 kg., while their team mates receiving beets made a total gain of 23 kg. The experiment showed that the beet tops were very palatable, and proved to be a satisfactory feed for work horses when fed in amounts up to 25 kg. daily.

The mineral metabolism in horses fed exclusively on bran, O. Bang (*K. Vet. og Landbohøjskole* [*Denmark*], *Aarsskr. 1925, pp. 383–404*).—Data are presented showing the intake and outgo of various minerals by a 12-year-old gelding receiving daily rations of 7 kg. of wheat bran alone and with 200 gm. of calcium carbonate, or of 7 kg. of rye bran and 44.3 gm. of sodium chloride. The horse was placed in a sling for the collection of feces and urine, following a preliminary feeding period on the same ration. The data dealing with the metabolism of the more important base- and acid-forming minerals are summarized in the following tables:

Average daily mineral metabolism of acid-forming minerals

Ration	P_2O_5		SO_3		Cl	
	Intake	Outgo	Intake	Outgo	Intake	Outgo
	Gram	*Gram*	*Gram*	*Gram*	*Gram*	*Gram*
Wheat bran	180.6	176.1	26.7	23.8	6.0	2.7
Wheat bran plus $CaCO_3$	180.6	173.3	26.5	26.1	5.7	1.8
Rye bran plus NaCl	163.0	168.7	25.2	32.2	31.2	29.2

Average daily mineral metabolism of base-forming minerals

Ration	CaO		Mgo		K_2O		Na_2O	
	Intake	Outgo	Intake	Outgo	Intake	Outgo	Intake	Outgo
	Gram	*Gram*	*Gram*	*Gram*	*Gram*	*Gram*	*Gram*	*Gram*
Wheat bran	14.9	32.5	46.0	41.3	91.0	90.8	4.9	5.0
Wheat bran plus $CaCO_3$	122.7	104.8	47.6	43.2	91.0	85.3	4.9	7.4
Rye bran plus NaCl	12.6	23.8	45.5	41.7	100.9	97.1	28.6	26.7

The results are discussed from the standpoint of acid and base equilibrium of the intake and outgo of minerals. In the first experiment the analyses showed that the feeding of a substance like wheat bran, containing a considerable excess of phosphoric acid and a deficiency of bases, resulted in a considerable loss of calcium. When the calcium carbonate was added to the bran ration much less phosphoric acid was excreted in the urine, and 3.5 times as much calcium oxide was found in the feces as during the preceding experiment when the ration consisted of bran only. The horse did not lose as much base equivalent during the rye bran experiment as during the wheat bran feeding, due to the lower phosphoric acid content and the smaller base deficiency of the former. In the rye bran experiment the horse appeared to show a small loss of phosphoric acid.

Textbook of horse breeding, G. Schwarznecker, rev. by G. Frölich (*Lehrbuch der Pferdezucht. Berlin: Paul Parey, 1926, 6. ed., rev., pp. VIII+682, pls. 41, figs. 140*).—This book gives accounts of the different breeds of horses and the principles of feeding, breeding, and stabling horses, and includes a chapter on conformation.

Poultry feeding experiments, J. E. Thomas (*Jour. Dept. Agr. Victoria, 24 (1926), No. 4, pp. 193–205*).—The results of feeding experiments with poultry

conducted at the State Research Farm at Werribee from 1921 to 1925 are summarized (E. S. R., 53, p. 374).

The raising and fattening of turkeys (*North. Ireland Min. Agr. Leaflet 37 (1926), pp. 6*).—The principles of turkey raising are described, and measures for the control of the most important diseases are recommended.

DAIRY FARMING—DAIRYING

The effect of ultra-violet light on the calcium and phosporus metabolism of the lactating animal, J. McA. Henderson and H. E. Magee (*Biochem. Jour., 20 (1926), No. 2, pp. 363–373, fig. 1*).—This paper gives a more detailed account of the results of experiments previously noted (E. S. R., 54, p. 274), including the results of a fourth experiment in which the calcium and phosphorus balances were determined in one animal during 58 days, starting one month after parturition. The animal was irradiated for 16 days, during which the calcium excretion in the feces averaged 7.85 gm. per day, as compared with 8.00 gm. in the preceding 16-day period and 8.85 gm. in the following period. The daily amounts of phosphorus in the feces during the respective periods averaged 4.20, 3.90, and 4.97 gm. There was an increased urinary excretion of calcium during the period of irradiation. The conclusions are in general agreement with those given in the earlier paper.

The mineral metabolism of dairy cows as affected by distilled water and previous feeding, C. F. Monroe and A. E. Perkins (*Jour. Dairy Sci., 8 (1925), No. 4, pp. 293–311*).—Essentially noted (E. S. R., 55, p. 169).

Effect of bone meal on growth of dairy heifers, W. D. Salmon and W. H. Eaton (*Jour. Dairy Sci., 8 (1925), No. 4, pp. 312–317, figs. 2*).—Two lots of four heifers each were selected for a study of the effect of feeding 2 oz. of steamed bone meal daily to the heifers of one lot at the Alabama Experiment Station. The remainder of the ration consisted of corn and oats and Johnson grass and timothy hay, with Bermuda, carpet grass, and dallis grass pasture during the grazing season. Weights and measurements taken at 28-day intervals from December 10, 1922, to April 26, 1924, showed only slight differences in the two groups, though both the ration and pasture were very low in calcuim.

Handbook of modern milk utilization, C. Knoch (*Handbuch der Neuzeitlichen Milchverwertung. Berlin: Paul Parey, 1926, pp. XII+564, pl. 1, figs. 153*).—The various processes in the handling of milk and the manufacture of dairy products are described in the different portions of the book, including special reference to various kinds of dairy equipment and the bacteria associated with the manufacture of the different products. The properties of milk, butter, cheese, condensed and dried milk, and dairy by-products are discussed.

On the physiology of lactic acid bacteria [trans. title], A. Voëtkevich (Wojtkiewicz) (*Vest. Bakt. Agron. Sta. (Ber. Bact. Agron. Sta. Moskau), No. 24 (1926), pp. 113–128; Ger. abs., p. 128*).—This deals with the effect of various factors on the activity of lactic acid bacteria and the variations in types found in Swiss cheese.

Coli types and ropy milk, W. Sadler and J. D. Middlemass (*Sci. Agr., 6 (1926), No. 9, pp. 297–302*).—Organisms causing ropy milk were isolated from milk produced on a certain farm. Samples of milk aseptically drawn into sterile test tubes, of milk taken at different stages in the usual process of straining, cooling, bottling, etc., and of the feed, bedding, and water were tested for the presence of rope-producing organisms.

The milk coming directly from the udder did not contain these organisms when aseptic precautions were observed, but such organisms were recovered from bottled milk, bedding, washings from a presumably clean pail, and from

milk at various stages after entering the milk pail. Eighteen typical strains were selected for a more detailed study of the characteristics of the organisms. The number of strains was later reduced to six. In general these types were short rods arranged singly or in clumps, were Gram-negative, and without capsules or motility. They produced an abundant growth on whey agar and in gelatin stab cultures, and produced ropiness in 7 to 17 hours at 21° C. in litmus milk, but no clotting occurred in several days.

Dextrose, lactose, galactose, saccharose, maltose, mannite, salicin, and glycerol were fermented with the formation of gas. Indol was not produced, but nitrates were reduced. All strains were killed by heating to 63° for 10 minutes.

A study of the cultural characteristics showed that all strains were closely allied to *Escherichia neapolitana* according to Bergey's classification, though slight differences were observed.

The original infection from the litter or manure probably infected the utensils, which continued the infection when improperly sterilized.

Carbonation of butter, M. J. Prucha, J. M. Brannon, and H. A. Ruehe (*Jour. Dairy Sci., 8 (1925), No. 4, pp. 318–329*).—In continuing the studies of the carbonation of dairy products at the Illinois Experiment Station (E. S. R., 47, p. 180), the effects of treating sweet cream with carbon dioxide, churning milk in a carbon dioxide atmosphere, and storing butter in a carbon dioxide atmosphere were determined, especially as related to the flavor and keeping qualities of the cream and butter and its influence on the development of germ life.

In the treatment of the sweet cream, gas was bubbled through different samples for 3 minutes on successive days, and the cream was kept at 40 and 70° F. The results showed that the first carbonation usually caused a slight reduction in the number of bacteria and retarded the development of acidity. It did not prevent bacterial growth, which later occurred at practically the same rate as in uncarbonated cream, though the types of bacteria were somewhat different. At room temperature both carbonated and uncarbonated cream kept about the same length of time, but at 40° F. the treated cream was sweet for 2 or 3 days longer.

In both laboratory and creamery tests churning in an atmosphere of carbon dioxide did not have any pronounced effects on the quality of the butter. A sour taste was evident in carbonated butter immediately after churning, which disappeared in storage. The treatment did not appear to affect the development of bacteria, molds, or yeasts.

Storing butter in a carbon dioxide atmosphere tended to suppress bacterial activity, especially at the lower temperatures, and such butter was always free from molds. The types of off-flavors developed after long storage were different from those found in uncarbonated butter.

The care of the churn and the quality and storing properties of the butter produced [trans. title], E. Haglund, C. Barthel, and E. Waller (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 297 (1926), pp. 23; Eng. abs., pp. 22, 23*).—In these investigations the authors have shown that an improperly sterilized oak churn may contaminate the butter made in it with yeast and molds. Various methods of treating the churn were compared, the most satisfactory of which appeared to be the use of steam for boiling the water in the churn. When the churn was allowed to stand for 3 to 5 days without use, it was again strongly infected. Butter made in a sterilized churn had a slightly better score after 10 to 20 days' storage than butter made in an infected churn.

Extra sterilization of the churns in 14 different dairies did not definitely improve the quality or keeping properties of the butter, indicating that satisfactory sterilization was employed.

A study of the organisms causing thickening of sweetened condensed milk, P. A. Downs (*Jour. Dairy Sci., 8 (1925), No. 4, pp. 344–369*).—In a study of the organisms causing thickening of condensed milk various types of bacteria from different sources were tested for their ability to thicken condensed milk. One thickened sample of commercial milk was found to contain almost a pure culture of a coccus.

Samples of fresh condensed milk were diluted in various ways and inoculated with creamery waste. The samples showed thickening and the presence of large numbers of cocci. A high acidity and a fruity odor were developed. Organisms producing thickening were later isolated from condensed milk, powdered milk, and from the air. A total of 1,054 cultures were studied, of which 318 caused thickening. The results indicated that the original source of the thickening organisms was the air, and that the milk probably became contaminated after manufacture.

The morphology and cultural characteristics of 32 of the cultures were studied to see if they were all of the same type. This study showed that these organisms were probably all variations of one type, resembling *Staphylococcus pyogenes albus* as closely as any. One of the strains was identical with this organism in cultural characteristics except that the latter would not thicken milk. Another strain did not reduce nitrates to nitrites and failed to ferment lactose. From the biochemical reactions of the thickening bacteria it was concluded that the thickening was caused by the production by the organism of a rennin-like enzyme.

Condensed milk and milk powder, O. F. Hunziker (*La Grange, Ill.: Author, 1926, 4. ed., rewritten and enl., pp. [16]+619, figs. 153*).—This is a revised edition of the book previously noted (E. S. R., 44, p. 373), which has been much enlarged to include the newer developments in equipment and processes resulting from dairy research, and deals especially with the physical, chemical, and bacteriological phenomena that influence the quality of condensed and powdered milk.

AGRICULTURAL ENGINEERING

Soil erosion from early plowed wheat land, F. L. Duley (*Jour. Amer. Soc. Agron., 17 (1925), No. 11, pp. 731–734*).—Studies conducted at the Missouri Experiment Station are reported which showed that under the conditions existing at the station the increased loss of soil by erosion due to early plowing for wheat may be considerable, and during this period has been slightly more than that during the rest of the year. On the whole, however, erosion from wheat land is not extremely serious, being only about half as much as from corn land. Where wheat follows another crop like corn or soy beans, and is itself followed by clover, the erosion is very greatly reduced. It is considered likely that on rolling lands in regions of rather high August and September rainfall it will be found more advisable to adjust the rotation so that the land will be covered with a crop practically all the time, rather than to emphasize the advantages of early plowing.

Soil erosion experiments on the experiment station, Peradeniya, T. H. Holland (*Ceylon Dept. Agr. Yearbook, 1926, pp. 5, 6, pls. 2*).—Data from experiments on the measurement of erosion in tea soils are presented. The data were obtained from isolated plats washing into tanks. The amounts of erosion from

the different plats varied, the variations being caused largely by the uneven number of fully grown tea bushes.

Ridge cultivation in lower Gujarat, B. M. Desai and K. B. Naik (*Bombay Dept. Agr. Bul. 123 (1925), pp. 30, pls. 8*).—A new method of cultivation is described, and the results of experiments in its application to the black soil tracts in lower Gujarat are presented. In this method crops are grown on ridges and not on the flat. With judicious cultivation between the ridges the yield of cotton can be raised either in wet, dry, or normal years by an average of from 23 to 25 per cent, and that of sorghum by an average of over 23 per cent of grain and from 5 to 10 per cent of fodder.

The experiments showed that ridge cultivation affords good surface drainage, and prevents the land from becoming partially water-logged in the upper 8 or 10 in. during the period of heavy rain. The amount of weeding in ridged plats was found to be considerably less than on the flat. The experiments were made on fairly clean fields, however. The root developments of both cotton and sorghum were deeper on the ridged plats. The ridge system of cultivation was found to permit late intertillage. In the early stages of growth the crop on ridges remained green while that on the flat became yellow during heavy rain. It was possible to work the soil on the ridges after heavy rains much earlier than on the flat.

Flow of water in 54-in. concrete conduit, Denver, Colo., F. C. Scobey (*Engin. News-Rec., 96 (1926), No. 17, pp. 678–680, figs. 3*).—Tests conducted by the U. S. D. A. Bureau of Public Roads of a 54-in. reinforced concrete conduit are reported which showed the capacity greater by 15 per cent than that accepted for the best conduits a few years ago. The results are taken to indicate that the Scobey formula, $V=C_sH^{0.5}d^{0.625}$, with a coefficient C_s of 0.37, as recommended for the best of concrete pipe, is very conservative. In this formula V is the velocity in feet per second, H is loss of head in feet per 1,000 ft. of pipe, and d is internal diameter in inches.

Public ground-water supplies in Illinois, G. C. Habermeyer (*Ill. State Water Survey Bul. 21 (1925), pp. 710, pl. 1, figs. 10*).—This bulletin presents information relating to the quantity and quality of ground water available throughout the State of Illinois.

Financial limitation in the employment of forest cover in protecting reservoirs, W. W. Ashe (*U. S. Dept. Agr. Bul. 1430 (1926), pp. 35, pls. 18, figs. 4*).—In this bulletin those regions in which the influence of forests in protecting reservoirs used for power purposes is most important are pointed out, and the value of forest cover and the financial limitations in its employment to prolong the utility of a reservoir are discussed.

The principles and practice of surveying.—II, Higher surveying, C. B. Breed and G. L. Hosmer (*New York: John Wiley & Sons; London: Chapman & Hall, 1926, vol. 2, 3. ed., pp. XVIII+489, figs. 184*).—This is the third edition of this handbook, which deals with higher surveying and is chiefly devoted to a consideration of the various methods of conducting topographic and hydrographic surveys. The subject matter is divided into the control of the survey, filling in topographic details, hydrographic surveying and stream gauging, and constructing and finishing maps.

Highway curves and earthwork, T. F. Hickerson (*New York and London: McGraw-Hill Book Co., 1926, pp. XIV+382, figs. 50*).—This handbook presents briefly the problems of highway location, laying emphasis on the subject of curves and earthwork, including the banking and widening of pavements. The economic and aesthetic advantages of easement spirals are explained, and a variety of original tables is presented to facilitate the layout of these curves.

A theoretical treatment of curves illustrated with numerous examples is also given.

High-alumina hydraulic cements, P. H. Bates (*Indus. and Engin. Chem., 18 (1926), No. 6, pp. 554–559, figs. 5*).—In a contribution from the U. S. Bureau of Standards the composition and properties of high alumina cement, especially as compared with Portland cement, are described, and its commercial uses are pointed out. This cement has a high strength and resistance to sulfate-bearing water, and attains the same strength in 24 hours that ordinary cements acquire in 28 days.

Strengthening and indurating concrete with sulphur, W. H. Kobbé (*Engin. News-Rec., 96 (1926), No. 23, pp. 940–942, figs. 2*).—The results of tests extending over a number of years are briefly summarized which indicate that concrete may be impregnated with sulfur with an increase in strength and decrease in absorption. Commercial flour of sulfur, or sulfur in any other form, when added to the mix has little or no effect on the strength even though this contained sulfur is subsequently melted. In carrying out the sulfur treatment the precast concrete products, preferably well cured, are immersed in a bath of molten sulfur until the requisite degree of absorption has resulted. The treatment is applicable to all types of concrete and cement mortars, including high alumina cement, and with any aggregate chemically inert toward sulfur.

Tests show how calcium chloride affects concrete, A. S. Levens (*Engin. News-Rec., 97 (1926), No. 6, pp. 214, 215, figs. 4*).—Studies conducted at the University of Minnesota to determine the effect of calcium chloride when used as an integral part of the mix upon the tensile and compressive strengths and the shrinkage effects of concrete are reported

In the tension tests the strongest concrete was that which contained 2 per cent of calcium chloride and was cured one day in the moist chamber and then dried. Percentages of calcium chloride over 2 tended to weaken the concrete. During the earlier periods of set the increase in strength of the concrete containing 2 per cent of calcium chloride was 40 per cent greater than that of plain concrete. After 21 days concrete containing from 2 to 3 per cent of calcium chloride was stronger than concrete containing no calcium chloride, but the difference in strength was not very great.

In the compression tests an enormous increase in strength was noted during a very short period, amounting to 106 per cent over that of plain concrete. The strongest cylinders were those containing 2 per cent of calcium chloride and cured in air for the entire period.

In the shrinkage tests the use of calcium chloride increased the shrinkage and hastened the setting time, this continuing throughout the entire test period.

Compressive and transverse strength of hollow-tile walls, A. H. Stang, D. E. Parsons, and H. D. Foster (*U. S. Dept. Com., Bur. Standards Technol. Paper 311 (1926), pp. 317–353, figs. 19*).—Strength tests of 70 hollow-tile walls constructed with ordinary workmanship under average indoor conditions are reported. The walls were all 6 ft. long, 9 ft. high, and were either 8 or 12 in. thick. Fourteen different lots of tile and 4 different mortars were used in their construction. Twenty-seven of the walls were subjected to a transverse test before being tested in compression under central loading. Fifty-three of the walls were tested in compression under central loading and 17 under eccentric loading.

The mortar and workmanship seemed to be the most important factors affecting the strength of the end construction walls. Those with cement lime mortar were about 5.1 times as strong as those with lime mortar. The

mortar had relatively less effect upon the strength of the side construction walls. Those with cement lime mortar had 2.4 times the strength of those with lime mortar. There seemed to be no constant ratio between the strength of the walls and the strength of the tiles, but in general, using the same mortar, this ratio decreased with an increase in tile strength. With the eccentrically loaded walls, the maximum loads supported were about 60 per cent of the loads for similar walls centrally loaded.

The transverse strength of the walls was largely affected by differences in mortar and in the position of the tiles. In general the stronger mortars gave higher transverse strengths, and the walls having the tiles laid on the side were stronger under side load than with the tiles on end.

Roof coverings: Their manufacture and application, E. G. BLAKE (*New York: D. Van Nostrand Co., 1925, pp. XI+264, figs. [143]*).—This book describes the origin, nature, and methods of preparing the various materials and substances that are employed for covering the roofs of all classes of buildings. It contains chapters on the character and properties of a roof covering, thatch, organic roof coverings, metallic coverings, mineral coverings, manufactured mineral coverings, asbestos cement, bituminous felts, asphalt, glass, and cement concrete.

Heat transfer and evaporation, W. L. BADGER (*New York: Chem. Catalog Co., 1926, pp. 306, figs. 113*).—This book is intended for research workers in heat transfer and evaporation as well as for engineers designing and operating evaporating systems. It contains chapters on general theory of heat transmission—conduction and radiation; heat transfer by convection—general; heat transfer between solids and gases, solids and liquids, and between solids and condensing vapors, especially steam; heating and heater design; evaporator bodies; heat transfer in evaporators; theory and calculations for multiple-effect evaporators; multiple-effect operation; evaporator auxiliaries; evaporators as applied in specific industries; and costs.

Relation between fuel deposition temperature and equilibrium boiling point, W. A. WHATMOUGH (*Indus. and Engin. Chem., 18 (1926), No. 6, pp. 609–612, figs. 3*).—Studies are reported the results of which are taken to indicate that equilibrium boiling point is a real measure of the volatility of a motor fuel under running conditions. Furthermore, the equilibrium boiling point of a motor fuel is an accurate guide to the induction pipe temperature necessary to maintain a combustible mixture in a stable condition and thereby prevent fuel deposition.

Influence of temperature, fuel, and oil on carbon deposition, S. P. MARLEY, C. J. LIVINGSTONE, and W. A. GRUSE (*Jour. Soc. Automotive Engin., 18 (1926), No. 6, pp. 607–612, figs. 6*).—Studies conducted at the Mellon Institute of Industrial Research are reported which showed that high operating temperature, the use of the more volatile fuels and a lean air-fuel mixture, and the use of lubricating oils of relatively high volatility which contain little carbon residue all tend to reduce the deposition of carbon in an internal-combustion engine.

The data indicate that the carbon values are fairly constant until the head temperature rises somewhat above 400° F., after which there is a drop in them as the heat is increased. Deposits formed at the lower temperatures are much more asphaltic, softer, and less adherent than those formed at the higher temperatures. With evaporative or steam cooling, the head temperature was as low as or lower than the lowest with water cooling, and carbon deposition was almost at the same rate as with water cooling at the same temperature.

No marked change in quantity of carbon was noted with different fuels through the series of commercial gasolines, but excessively high carbon values

were obtained with heavy cleaners' naphtha and kerosene. A benzol blend gave slightly more deposit than motor fuel, but the deposit was softer and more soot-like. Natural gas gave only 5 per cent less deposit than commercial gasoline. This is taken to indicate that in a 12 : 1 mixture a good average grade of gasoline plays a very small part in the deposition of carbon.

In runs simulating ordinary cool-weather operation, with a 10 : 1 ratio of air and ordinary gasoline, lubricating oils distilled from Pennsylvania and Mid-Continent crudes gave considerably higher carbon deposits than oils derived from Gulf Coastal crudes.

Under conditions simulating summer operation, with a mixture ratio of 12 : 1, the carbon deposit with Gulf Coastal oil was only half of that with Pennsylvania oil, while that from Mid-Continent oil was midway between. Carbon deposits from Gulf oils were, in general, dry, powdery, and friable, while those from Pennsylvania oils were very hard and adherent over the hotter areas and sticky and asphaltic over the cooler areas of the combustion chamber. It is considered probable that the belief that there is a connection between so-called heat-resisting properties of an oil and its desirability as a lubricant is erroneous. The results indicate that oil which will leave the least residue upon evaporation from the metal surfaces will give the least trouble from carbon deposition.

Antiknock materials, W. H. Charch, E. Mack, jr., and C. E. Boord (*Abs. in Indus. and Engin. Chem., 18 (1926), No. 4, pp. 334–340, figs. 7*).—Studies conducted at Ohio State University on antiknock materials are reported.

Nickel as the carbonyl was found to have an antiknock coefficient of 30; bismuth in its trialkyl and triaryl derivatives possessed a coefficient of from 18.2 to 20.2; and cadmium in its alkyl compounds and titanium as the tetrachloride were also found to function but in a less marked degree. The state of valence of the antiknock element is not essential in determining which of its compounds should function.

Experiments on suppression of detonation in an open tube led to the conclusion that an attempt to apply the results obtained with the detonation tube to a study or an explanation of the suppression of the fuel knock in a motor is unjustified.

Studies on the electrical conductivity of the cylinder gases as a function of detonation showed that gaseous ionization decreases with decreasing detonation in internal-combustion engines. This decrease is noted irrespective of whether the knock is suppressed by the addition of an anti-knock compound or by changing the composition of the fuel. This is taken to indicate that antiknock materials affect this ionization only in so far as they tend to suppress detonation.

A chemical theory of antiknock materials and their action in suppressing detonation is presented.

Audibility anti-knock tests and knock-intensity evaluation, D. Roesch (*Jour. Soc. Automotive Engin., 19 (1926), No. 1, pp. 17–28, figs. 18*).—In a contribution from the Armour Institute of Technology a method of studying antiknock qualities of fuels, combustion chamber shapes, and efficiency of gasoline dopes is described.

The gas engine on the farm.—II, Starting troubles and their remedy, F. L. Fairbanks and F. G. Behrends (*N. Y. Agr. Col. (Cornell) Ext. Bul. 133 (1926), pp. 60, figs. 43*).—Practical information on troubles encountered in the starting of farm gas engines is presented, continuing the series (E. S. R., 52, p. 288).

The wind-driven electric light plant, F. C. FENTON (*Iowa Agr. Col. Off Pub., 24 (1926), No. 32, pp. 6-9, figs. 3*).—Data from experiments at the Iowa Experiment Station on wind-driven electric light plants are briefly presented.

It was found that in most respects the airplane propeller wheel is apparently an improvement over the old type of windmill wheel, although the output of current, judging by three months' observation, was somewhat less. The airplane wheel began to send current into the batteries at a wind velocity of about 10 miles per hour. The current increased rapidly as the wind velocity increased from 15 to 20 miles per hour. Wind velocities above 25 miles per hour brought little increase in current, because the wheel did not remain facing the wind. This is taken to indicate that the propeller may be somewhat more efficient in high winds than the old type wheel, but it is much less efficient in low winds, since it can not utilize a velocity below 10 miles per hour.

Tests of agricultural machines [trans. title], M. RINGELMANN (*Ann. Sci. Agron. Franç. et Étrang., 43 (1926), No. 1, pp. 35-44*).—Methods of testing agricultural machines and of mechanical experimentation followed in the station for testing machines of the National Institute of Agronomy of France are briefly described.

Plows and plowing, E. A. HARDY (*Saskatchewan Univ., Col. Agr. Ext. Bul. 32 (1926), pp. 29, figs. 30*).—Practical information on walking and riding plows, moldboard and disk plows, plow adjustments and hitches, and methods of plowing is presented.

Motor plowing tests with monopolin and benzol [trans. title], F. FRITZ (*Technik Landw., 7 (1926), No. 7, pp. 45-47*).—Plowing tests with tractors and motor plows under as nearly as possible identical conditions to compare an alcohol-benzol mixture with straight benzol for fuel are briefly reported.

In all cases more of the mixed fuel was used than of the straight benzol, but this was apparently more than compensated for by the lower cost of the mixed fuel. The estimation of fuel consumption on the basis of time was found to be erroneous, a better basis being area plowed or volume of soil turned.

The conclusion was drawn that fuels consisting of mixtures of alcohol with more volatile materials, such as benzine or benzol, may be successfully used in tractor plowing.

A study of the dynamics of the disk harrow, E. G. MCKIBBEN (*Agr. Engin., 7 (1926), No. 3, pp. 92-96, figs. 7*).—Studies conducted at the California Experiment Station are reported which showed that by the proper arrangement of gangs it is possible to obtain a disk harrow which tills a strip of land, the center of which is offset from the center of the tractor, and which at the same time operates without side draft upon either the harrow or the tractor. Only one position behind the tractor could be found where a given disk harrow with a given arrangement, position, angle, and weighting of gangs, operating at a given speed on given soil conditions, could be operated without side draft. It was found possible to design a disk harrow in which the gang arrangement could be easily changed so that it might be operated without side draft, either directly behind the tractor or with either a large right or left hand offset.

Single grain seeding machines [trans. title], A. NACHTWEH (*Deut. Landw. Presse, 51 (1924), Nos. 12, pp. 126, 127; 13, p. 137, figs. 5; 15, p. 160, figs. 10; 16, p. 174, figs. 10; 17, pp. 186, 187, figs. 7; 18, p. 197, figs. 2*).—A review of the history of the development of single grain seeding machines is given.

Tests of fertilizer spreaders and grain binders [trans. title], MARTINY and FISCHER (*Arb. Deut. Landw. Gesell., No. 330 (1925), pp. 68, figs. 42*).—Comparative service tests of a number of different makes of fertilizer spreaders and grain binders are reported.

The fertilizer spreader tests showed that with heavy fertilizer applications distribution was generally quite uniform, but that uniformity of distribution decreased as the size of application decreased. This was especially true with such materials as lime and kainit. Uniformity of distribution was found to depend upon the discharging apparatus and vibration of the machine, the uniformity of speed of operation, and the nature of the fertilizer.

German binders gave as good results as American machines.

Automatic feed grinding with motors, J. B. Davidson (*Iowa Agr. Col. Off. Pub., 24 (1926), No. 32, pp. 4–6, fig. 1*).—Experiments conducted at the Iowa Experiment Station indicated that a small motor can be used for feed grinding, that time control is practicable, and that quantity control is easily arranged. The small grinder was found to have as high an efficiency as larger grinders, and the use of magazine bins saved labor.

A survey of farm fires (*Harrisburg: Penn. State Police, 1925, pp. 35*).—This survey, made by the Bureau of Fire Protection of the Pennsylvania State Police in cooperation with the Pennsylvania Experiment Station, deals with the cause of farm fires in the State and gives practical information on prevention. Special attention is drawn to the danger of spontaneous combustion, and this phenomenon is discussed in some detail, with special reference to means for preventing its occurrence. A list of 32 references to literature bearing on the subject is included.

North Carolina poultry houses, A. G. Oliver, H. H. Gordon, C. F. Parrish, and B. F. Kaupp (*N. C. Agr. Col. Ext. Circ. 161 (1926), pp. 8, fig. 1*).—Information on the construction of poultry houses adapted to North Carolina conditions is given, together with bills of material for typical houses.

Colony brooder houses, A. C. Smith, C. E. Cooke, and H. B. White (*Minn. Univ. Agr. Ext. Spec. Bul. 105 (1926), pp. 12, figs. 7*).—Practical information on the planning and construction of colony brooder houses adapted to Minnesota conditions is presented, together with working drawings of typical structures.

Equipment for hogs, A. L. Durant (*Clemson Agr. Col. S. C., Ext. Bul. 71 (1926), pp. 27, figs. 16*).—Structural equipment for hog farms, including fencing, buildings, feeders, watering devices, breeding crates, etc., is described. Working drawings and bills of materials for this equipment are included.

Mechanical conservation of organic manures, E. Berendt (*Mechanische Konservierung des Organischen Düngers. Neudamm: J. Neumann, 1925, pp. 86, pls. 3, figs. 20*).—This is a handbook of information on the construction of liquid and solid manure pits, compost pits, and sanitary cow stables.

Farm water supply and sewage disposal in West Virginia, F. D. Cornell, Jr. (*West Virginia Sta. Bul. 206 (1926), pp. 27, figs. 23*).—Studies of the sanitary conditions on 287 farms in three West Virginia counties are reported. Of the farms visited, 66 could have had the convenience of running water in the house by merely piping the water direct. Cisterns seemed to be growing in popularity as a source of water supply, but not enough attention was being paid to properly filtering the cistern water used for drinking purposes.

On 124 of the farms the open back privy was in use, 90 others were built on the surface but closed at the rear, and on 21 farms there were no privies at all. No septic tank privies were found, and only 44 of the farms had pit privies.

Where bath equipment was found the effluent was either drained out on the surface of a field or into a near-by creek. No septic tanks were found, although the need for them was apparent.

A septic tank, E. R. Gross (*N. J. Agr. Col. Ext. Bul. 52 (1926), pp. 16, figs. 13*).—Practical information on the disposal of farm sewage is given, together

with working drawings and data for typical structures adapted to New Jersey conditions.

Some observations on sewage tank gases, A. M. BUSWELL and S. I. STRICKHOUSER (*Indus. and Engin. Chem., 18 (1926), No. 4, pp. 407–409*).—The results of studies conducted by the Illinois State Water Survey Division are reported which show that gases from foaming Imhoff tanks contain more carbon dioxide, less nitrogen, and substantially the same amount of methane as gases from nonfoaming tanks. It is thought that the amount and heating values of gas available from Imhoff tanks are sufficient to warrant its collection and use for fuel purposes.

RURAL ECONOMICS AND SOCIOLOGY

Variations in costs of producing corn, wheat, and other crops in Greene County, Ohio, J. I. FALCONER and J. F. DOWLER (*Ohio Sta. Bul. 396 (1926), pp. 233–284*).—The cost of producing crops was studied on 25 farms during 1920 to 1924, the data being collected by the route method. The average area of the farms was 162 acres, of which 137 acres were in rotated crops and 10 acres in permanent pasture. An average of 51 acres was in corn, 27 in wheat, 13 in oats, 24 in rotated pasture, and 17 in hay. Tables are given showing for each farm the man, horse, and tractor labor used per acre, the expenditures for labor, manure and fertilizer, taxes, interest, seed, equipment, overhead, etc., the yields, and the total costs per acre and per bushel of growing corn up to harvest and of growing and harvesting wheat and oats. Similar tables are included for harvesting corn by different methods and for growing and harvesting hay and alfalfa and for producing pasture. The costs, including interest, were found to be 34 to 57 cts. per bushel, with an average of 46 cts., for growing corn up to harvest; 81 cts. to $1.32, averaging 94 cts., for growing and harvesting wheat; 30 to 98 cts., averaging 50 cts., for growing and harvesting oats; $5.88 to $15.07 per ton, averaging $11.46, for growing and harvesting hay; and $1.41 to $3.13, averaging $2.18, per animal-unit-month for producing clover and timothy pasture.

Analaysis is made of the costs on the several farms to show the factors that increase costs, and the methods of gaining efficiency and lower costs of production. The costs per bushel of harvesting corn, allowing credit for stover, varied as follows, with labor charged at the average regular labor price: Husked from stalk 9.9 cts., cut by binder and husked from shock 13.2 cts., cut by hand and husked from shock 11.2 cts., and cut by hand and shredded 10.4 cts. With labor for cutting, shredding, and husking from shock at contract prices, the costs were from 2 to 7.2 cts. per bushel higher. The following standard labor requirements per acre for the different crops were obtained: Growing corn 7.9 man-hours, 24.9 horse-hours; husking corn from stalk 6.3 man-hours, 12.6 horse-hours; cutting corn with binder and husking from shock 16.5 man-hours, 9.4 horse-hours; growing and harvesting wheat 6.2 man-hours, 10.3 horse-hours; growing and harvesting oats when seed was drilled 6.1 man-hours, 11.2 horse-hours; growing and harvesting oats when seed was broadcasted 5.6 man-hours, 9.3 horse-hours; and growing and harvesting hay 5.1 man-hours and 7.4 horse-hours.

Cost of living on Iowa farms, [I], G. H. VON TUNGELN, J. E. THADEN, and E. L. KIRKPATRICK (*Iowa Sta. Bul. 237 (1926), [pt. 1], pp. 56, fig. 1*).—This study, which was carried on cooperatively with the Bureau of Agricultural Economics, U. S. D. A., is one of the series previously referred to (E. S. R., 50, p. 595) and covers 472 farms in 4 areas in Boone, Story, and Sac Counties, of which 212 were operated by owners, 239 by tenants, and 21 by hired men. The average size of the families was 4.7 persons for owners and hired men

and 4 persons for tenants. Tables and interpretative text are included showing for each class of operators the size of family, ages of parents and children, relation of tenants to landlords, education of operators, their wives and children, reading matter in homes, size of farms, size and value of houses, modern conveniences and labor-saving devices, and by class of operators and area studied the expenditures for the different items entering into the cost of living, the proportion of the living furnished by the farms, etc.

The average total annual family costs of living in the 4 areas were $1,875.90 for owners, $1,506.40 for tenants, and $1,431.50 for hired men, of which $1,119.20, $861.20, and $842.40, respectively, was expended in cash, the balance in each case being furnished by the farm. Of the average total costs for the families of the 451 owners and tenants food, clothing, rent, furnishings and equipment, operating expenses, health, advancement, personal expenses, and insurance represented 37.1, 14.6, 15.5, 2, 14.2, 5, 6.5, 1.6, and 3.5 per cent, respectively. Of the families of owners 6.6 per cent had expenditures of $1,000 or less, and an equal number had expenditures of $3,000 or more. The corresponding percentages for tenants were 9.2 and 1.2. Tenants averaged 12.8 years younger than owners, and their families averaged 0.8 of a person smaller.

Cost of living on Iowa farms.—II, Household expenditures, H. Kyrk (*Iowa Sta. Bul. 237* (*1926*), *pt. 2*, *pp. 57–79*).—Part 2 is based upon the study of the account books of 10 farm families, the average size of which was 3.5 persons. The average cash expenditures were $927, of which the expenditures for food, clothing, furnishings and equipment, operating expenses, and health were 21.7, 19.1, 6.3, 26.5, and 4.4 per cent, respectively, as compared with $982.50 and 13.2, 14.6, 2, 12, and 5 per cent, respectively, for the 451 families of owners and tenants included in part 1 (see above).

The ownership of tenant farms in the United States, H. A. Turner (*U. S. Dept. Agr. Bul. 1432* (*1926*), *pp. 48, figs. 21*).—This study is based on data of the U. S. Bureau of the Census of 1920 for 256,175 rented farms in 184 selected counties in 24 States. Tables and explanatory texts are given covering the concentration of ownership; residence, age, farming experience, and occupation of owners of rented farms; method of acquiring ownership; kinship of tenants to owners; supervision and advice given tenants by owners; and the tendency with regard to fertility on rented farms. Comparisons are made with data of the census of 1900 for all rented farms in the United States.

The landlords in 1920 owned an average of 1.65 farms and 169 acres, as compared with 1.54 farms and 147 acres in 1900. Large holdings of rented farms are few in the Northern States, but are fairly common in the Southern States. The percentage of landowners resident in the same State as the lands owned increased from 94.7 in 1900 to 94.9 in 1920, and of those resident in the same county from 78.8 to 80.4. Only 16 per cent of the acreage owned by landlords in 1920 had been inherited and only 8 per cent of the landlords had not had farm experience. In the South 54 per cent of the owners were farming themselves, 67 per cent lived on farms, and only 10 per cent reported themselves as having no occupation. In the North only 20 per cent of the owners were farming, 37 per cent lived on farms, and 35 per cent were without occupation. On an average only 12 per cent of the tenants in the southern areas were related to their landlords, while in several of the northern areas as high as 33 per cent were related by blood or marriage.

The ownership of tenant farms in the North Central States, H. A. Turner (*U. S. Dept. Agr. Bul. 1433* (*1926*), *pp. 40, figs. 17*).—This bulletin deals with the conditions in 85 counties in 12 of the North Central States, being a special report of part of the counties covered in the preceding bulletin.

About 4 per cent of the rented farms were owned by men owning five or more farms and about 10 per cent of the rented acreage by owners of 1,000 acres or more. Landlords owning one or two rented farms owned 88.7 per cent of the rented farms in 1920, as compared with 87.4 per cent in 1900. In 1920, 73.7 per cent of the rented farms were owned by persons living in the same county and 89.2 per cent by persons living in the same or adjoining counties. Forty per cent of the owners were found to live within 3 miles of their rented farms. The average age of landlords was nearly 60 years, over 90 per cent of them had had farm experience, and a large proportion had been tenants. Over one-third of the tenants were related to their landlords. The landlords had acquired only about one-seventh of their acreage by inheritance and 70 per cent of them had more than one child.

The taxation system of South Carolina, W. H. Mills (*South Carolina Sta. Bul. 231 (1926), pp. 79, figs. 2*).—This investigation was conducted jointly with the tax conference called by the Governor, the object being "to study the tax system of South Carolina, its manner and method of return of property for taxation, particularly as related to agriculture; to discover inequalities as between county and county, person and person, class and class; to determine what tax revisions are necessary and where they can be made, to get the facts of the present system, and use these as a basis for legislation to effect a just and equitable tax system for the State."

The present constitutional provisions and statutes pertaining to taxation are set forth and the actual workings thereof discussed. The recommendations to the tax conference for improving the taxation system made by the committee of seventeen appointed by the chairman of the tax conference and referred to the 1926 session of the legislature are given, together with a discussion of the legislation passed. The changes still most desired are such supervision and control by the tax commission as will place all tangible property, real and personal, upon the same basis; such amendments to the constitution and the statutes as will permit the classifying of property into tangible and intangible and the assessing of the two classes at different rates; and the subdivision of these classes for State, county, and municipal taxing purposes.

Cooperative cream pools in Idaho, F. W. Atkeson and D. L. Fourt (*Idaho Sta. Bul. 144 (1926), pp. 33, figs. 6*).—From 4 pools organized in 1922 the number to May, 1926, had increased to 14, besides 2 which had developed into cooperative creameries. The 9 pools operating in 1925 paid from 2.86 to 7.34 cts. more per pound for butterfat than the cream station prices, the average being 4.7 cts. on 1,999,660 lbs. handled. The number of cream stations or buyers in the territory of 8 of the pools was reduced during the first year of operation of the pools from 29 to 11. In 3 pools organized in 1922 and 1923 the percentage of sweet cream handled increased from 58.8, 48, and 70 per cent, respectively, in 1923, to 81.8, 78, and 78 per cent in 1925. The outstanding advantages of cream pools are set out and suggestions given as to the methods of organization and operation, including legal forms.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Farm youth: A selected list of references to literature issued since January, 1920, compiled by M. T. Olcott and L. O. Bercaw (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 17 (1926), pp. [3]+40*).—A mimeographed list of the literature on rural youth in the United States, prepared for use at the Ninth National Country Life Conference, November, 1926.

Boys' and girls' 4–H club work, C. B. Smith (*U. S. Dept. Agr., Misc. Circ. 77 (1926), pp. II+16, figs. 13*).—In 1925 about 565,000 rural boys and girls out of 11,000,000 in the United States from 10 to 18 years of age were enrolled in

about 41,000 4-H clubs. This circular, prepared at the request of the committee on extension organization and policy of the Association of Land-Grant Colleges, presents a statement of the object of club work, what club work is and does, and the club problem, and outlines the national program for expanding the work.

A decade of negro extension work, 1914–1924, O. B. MARTIN (*U. S. Dept. Agr., Misc. Circ. 72 (1926), pp. 11+30, figs. 12*).—A historical account of the development, activities, and results of negro extension work from 1914 to 1924.

FOODS—HUMAN NUTRITION

A study of certain factors affecting shrinkage and speed in the roasting of meat, A. F. MORGAN and P. M. NELSON (*Jour. Home Econ., 18 (1926), Nos. 7, pp. 371–378, figs. 3; 8, pp. 444–448*).—In an effort to determine means of hastening the roasting process for meats without detracting from the quality of the finished product, 2-rib standing beef roasts were roasted under varying conditions with thermometers inserted in the meat to record internal temperatures as in previous studies of Sprague and Grindley (E. S. R., 19, p. 665).

The effect was first studied of nickel-plated copper skewers plunged hot into the raw meat and kept there during the roasting. The roasts were removed when internal temperatures were reached of 51° C. for rare meat, 60° for medium, and 70° for well done. The time required to reach these temperatures was considerably shortened by the use of the skewers, the average decrease being 6.6 minutes per pound or about 30 per cent. The decrease in time appeared to be proportional to the amount of copper (number of skewers) introduced. The total loss of weight was less with the skewered than with the unskewered meat. When the skewers were removed as soon as the meat was taken out of the oven the usual rise in internal temperature of the roast occurred, but when left in the cooling was immediate. The skewered roasts were uniformly more juicy, tender, and appetizing in appearance than the unskewered.

A comparison of the results obtained in covered and uncovered pans was also made, with the general conclusion that with respect to speed of roasting, shrinkage, appearance, and taste there was no great difference between the two. In comparing the speed of cooking and the shrinkage of roasts in which the initial temperature of 250° was lowered after 15 minutes to 175° with that of roasts cooked throughout at the initial high temperature, it was concluded that there is relatively small advantage in decrease of shrinkage in the first method but a decided advantage in speed in the second. This was particularly true when skewers were used.

No definite relation appeared to exist between size of roast and length of time per pound required to reach a given internal temperature in the unskewered roasts. With the skewered meats there was a more definite decrease in time per pound with decreasing size. Shrinkage depended entirely upon the length of time of roasting. The speed was directly proportional to the surface area of unskewered and inversely proportional in the case of skewered roasts. The loss of weight from bones when roasted in their natural place in the cut was found to be negligible. The loss of fat was irregular, depending upon its location and concentration in the raw meat.

The problem of test bakes, with a discussion of certain of their chemical and physical aspects, F. L. DUNLAP (*Cereal Chem., 3 (1926), No. 4, pp. 201–215*).—In this discussion the author emphasizes the importance of the initial H-ion concentration of the flour as affecting the quality of the test loaf, presenting evidence from the literature and from his own experience that flours with a lowered initial pH and short fermentation periods yield better results

than fresh flour under any conditions of working and fermenting the dough. Attention is called to the fact that the personal element enters into baking tests, and that tests conducted on the same flour simultaneously by different workers may give quite different results. In the use of flours with a lowered pH, reversing the time periods of fermentation by having the shorter period first is recommended.

The problem of standardizing the experimental baking test, M. J. Blish (*Cereal Chem., 3 (1926), No. 4, pp. 216–222*).—Attention is called chiefly to different interpretations of the term "baking quality." In the author's opinion this term should refer to the inherent possibilities of a given flour, and "baking strength" to this quality, together with the ability more or less successfully to withstand a certain amount of variation in handling. With this distinction of terms it is thought that a standard experimental baking process should indicate strength rather than quality alone.

Woman's Institute library of cookery, I–V (*Scranton, Pa.: Woman's Inst. Dom. Arts and Sci., 1925, vols. 1, pp. VI+[233]+XIII, figs. 87; 2, pp. VI+[218]+XI, pl. 1, figs. 71; 3, pp. VII+[250]+XII, pl. 1, figs. 155; 4, pp. VI+[251]+X, figs. 127; 5, pp. VIII+[311]+XIV, pl. 1, figs. 93*).—These five volumes comprise the instruction papers of the courses in cookery of the Woman's Institute of Domestic Arts and Sciences, Scranton, and as such include instruction covering the various phases of the subject of cookery as it is carried on in the home, together with selected recipes for the various types of foods discussed. The arrangement of subject matter is as follows: Essentials of cookery, cereals, bread, and hot breads; milk, butter, and cheese, eggs, and vegetables; soup, meat, poultry and game, and fish and shellfish; salads and sandwiches, cold and frozen desserts, cakes, cookies, and puddings, and pastries and pies; and fruit and fruit desserts, canning and drying, jelly making, preserving, and pickling, confections, beverages, and the planning of meals.

Foods and drugs, J. M. Bartlett (*Maine Sta. Off. Insp. 119 (1926), pp. 32*).—This is the annual tabulation of the results of the examination of food and drug samples collected by the inspectors of the division of inspection of the State department of agriculture (E. S. R., 54, p. 790).

Ice cream as a cause of epidemics, F. W. Fabian (*Amer. Jour. Pub. Health, 16 (1926), No. 9, pp. 873–879*).—A review of the literature on epidemics which have been traced to ice cream is reported, with recommendations for sanitary precautions to protect the ice cream supply. The safeguards suggested are pasteurizing the ice cream mix at 150° F. for 30 minutes, establishing a bacteriological standard of 100,000 colonies per gram, and regular sanitary inspection of ice cream plants. A list of 44 references to the literature is appended.

Can purines, creatinine, or creatine replace histidine in the diet for purposes of growth? G. J. Cox and W. C. Rose (*Jour. Biol. Chem., 68 (1926), No. 3, pp. 769–780, figs. 4*).—In this and the following paper are presented the results of growth experiments in which young rats received diets deficient in histidine but supplemented with organic compounds similar to histidine in their chemical structure, the object being to determine whether or not these compounds can replace histidine in metabolism.

In the present study adenine, guanine, creatine, and creatinine alone and in combination were substituted for histidine in an otherwise complete diet. In no case was there any growth response. "It is evident that the purines, despite the fact that they contain the imidazole grouping, are quite unable to replace histidine in nutrition. This fact would appear to indicate that the formation of purines from histidine is an irreversible reaction in the animal body."

The availability of synthetic imidazoles in supplementing diets deficient in histidine, G. J. Cox and W. C. Rose (*Jour. Biol. Chem., 68 (1926), No. 3, pp.*

781–799, figs. 5).—Several synthetic compounds containing the imidazole ring were substituted for histidine in a basal diet in which the nitrogen was supplied in the form of completely hydrolyzed casein from which most of the histidine had been removed by precipitation with silver sulfate and barium hydroxide. All of the compounds tested were without effect with the exception of *dl*-β-4-imidazole lactic acid, which caused an immediate resumption of growth at a rate only slightly slower than that induced by an equivalent quantity of histidine. "It is evident that under the conditions of the experiments the synthetic product in question is capable of serving in place of histidine, probably through being transformed by the cells into the amino acid. The above results constitute the first successful attempt, by means of growth experiments, to replace an indispensable amino acid of the diet by a nonamino compound."

Studies in carbohydrate metabolism.—I, The utilisation of dihydroxyacetone by the animal body and a method for its estimation, W. O. KERMACK, C. G. LAMBIE, and R. H. SLATER (*Biochem. Jour., 20 (1926), No. 3, pp. 486–496*).—Evidence is presented that dihydroxyacetone is capable of curing insulin hypoglycemia in rabbits and mice in approximately the amounts and time required for glucose, and that it is more rapidly removed from the blood stream by the muscles than is glucose or levulose. This was also demonstrated in diabetic individuals, and is thought to indicate that dihydroxyacetone is directly utilizable by the normal animal organism without being first converted into glucose.

A method is outlined for the detection and estimation of dihydroxyacetone in small amounts of blood.

The vitamins (A, B, and C) of papaya, C. D. MILLER (*Biochem. Jour., 20 (1926), No. 3, pp. 515–518*).—A limited amount of evidence is given that Hawaiian papaya "is only a fair source of vitamin B, a good source of vitamin A, and an excellent source of vitamin C." In the vitamin A and B studies the amounts of papaya fed daily varied from 5 to 20 gm. There was some growth even on the smallest amount in the A experiments, but satisfactory growth was not secured in the B experiments on amounts below 20 gm. The minimum dosage for protection against guinea pig scurvy was not determined, but 3 gm. appeared to give as complete protection and to cause as good gains in weight as 5 gm.

The bodily store of vitamin A as influenced by age and other conditions, H. C. SHERMAN and L. B. STORMS (*Jour. Amer. Chem. Soc., 47 (1925), No. 6, pp. 1653–1657, fig. 1*).—"The experiments described in the present paper deal (1) with the age at which experimental animals (albino rats), under known conditions of feeding, attain their maximum store of vitamin A as indicated by the length of time they are able to survive when transferred to a diet devoid of this vitamin but adequate in all other respects, and (2) with the influence of previous feeding upon the relative store of vitamin A in the body at different ages as indicated by the period of survival when placed on vitamin A-free food."

In the first series male white rats, which had previously received a diet of ⅓ whole milk powder and ⅔ ground whole wheat, with salt in the proportion of 2 per cent of the weight of the wheat, were transferred to a vitamin A-free diet at different ages, and their survival periods noted. The average survival period for rats placed at 4 weeks of age on the basal diet was 63 days, at 2 months 111, at 3 months 122, at 4 months 148, at 6 months 171, and at 9 months 140 days. The age at which the survival period was the longest is that at which full adult size is reached, showing that storage of vitamin A increases with growth to maturity. In the animals in this series, three-fourths of those placed at 4 weeks upon the vitamin A-free diet developed ophthalmia before death, while among those from 2 to 9 months of age only one-fourth developed

it on the same diet. The older animals proved more susceptible than the young to lung infection. Other clinical symptoms noted in animals dying from vitamin A deficiency were pus in one or more of the glands at the base of the tongue and pus in the middle ear, both affecting about 75 per cent of the animals, and sinusitis in about 50 per cent.

Parallel with this series similar experiments were carried on with female rats on the same diet and with males and females on a diet consisting of ⅙ milk powder and ⅚ whole wheat and consequently furnishing less vitamin A. The survival periods were in all cases longer for the animals which had been fed the diet richer in vitamin A, and on both diets increased with the age of the animals when placed on the deficient diet. A comparison of the survival periods of males and females from the same stock on the same diet showed differences in favor of the females negligible at 4 weeks but becoming more distinct with age and development. "It is interesting that pregnancy and suckling of young have not, in the few cases yet studied, seemed to deplete the female organism of vitamin A to the extent of noticeably shortening her survival period. The possibility is therefore suggested that the development and exercise of the reproductive functions in the female may enhance the ability to conserve vitamin A or in some way to use it more economically in case of need."

A quantitative study of the storage of vitamin A, H. C. Sherman and M. L. Cammack (*Jour. Biol. Chem., 68 (1926), No. 1, pp. 69–74, figs. 2*).—In continuation of the above-noted studies on vitamin A storage under varying conditions, a series of rats was fed from weaning on the one-third whole milk powder two-thirds ground wheat diet alone and with 1, 2, and 4 per cent of cod-liver oil for 3, 4, and 6 months after weaning, after which the vitamin A-free diet was fed until death. Grouped by the age at which the transfer to the deficient diet was made, the survival periods increased with the length of time on the original diet, and within the age groups increased, although not in the arithmetical proportion, with the richness of the original diet in vitamin A.

In the second series, the vitamin A-containing diet was given for 2 and 6 months, respectively. In addition to the groups on this diet alone, other groups were given 4 per cent of cod-liver oil for varying lengths of time, 1, 2, and 4 weeks for the first group and 1, 2, 4, 8, and 20 weeks for the second. The addition of cod-liver oil for only 1 week increased the survival period by more than 40 days. With longer periods the survival periods were lengthened, but again not in arithmetical proportion.

In a supplementary experiment, 3 rats from a single litter were given 4 per cent of cod-liver oil for 2, 4, and 7 days, respectively, after weaning, and the remaining one was placed at once on the vitamin A-free diet. The survival period was increased by 30 days or over 50 per cent by the 2 days' feeding, about 90 per cent by the 4 days', and 120 per cent by the 7 days' feeding of the cod-liver oil. In another instance 1 day's feeding of cod-liver oil ad libitum increased the average survival period of 2 rats by more than 50 per cent over that of 2 controls from the same litter, all of which had been kept on the vitamin A-free diet until growth ceased.

It is concluded that "attainment of the maximum store of vitamin A is apparently a process of gradual accumulation which is relatively rapid in its earlier stages and becomes slower as the maximum is approached. A rapid storage of the entire maximum amount is apparently not possible."

Destruction of vitamin A in milk by ultra-violet light, R. W. Titus, J. S. Hughes, W. R. Hinshaw, and J. B. Fitch (*Indus. and Engin. Chem., 18 (1926), No. 8, p. 843, fig. 1*).—Two lots of day-old White Leghorn chicks, 14 in each lot, were fed identical rations of 90 per cent white corn chop and 10 per cent tankage supplemented with 5 cc. of fresh whole milk as the sole source of

vitamin A. The milk fed one lot was untreated and the other irradiated in shallow pans. All of the chicks were irradiated for 15 minutes daily.

At the end of 7 weeks all but 1 of the chicks receiving the irradiated milk had died as against only 2 of the lot receiving the nonirradiated milk. Two of the chicks which died in the first lot showed well advanced stages of ophthalmia. Other lesions noted were enlargement of the kidneys, with deposits of urates in the tubules, and similar deposits in the pericardial sac, over the pericardium, and covering the liver and intestines. The results are thought to point to a definite destruction of vitamin A through irradiation, and to indicate that while the irradiation of milk increases its nutritive value for infant feeding through increasing its content of vitamin D it at the same time decreases its value as a source of vitamin A.

The difference in chemical composition of the skeletons of young rats fed (1) on diets deprived of fat-soluble vitamins and (2) on a low phosphorus rachitic diet, compared with those of normally nourished animals of the same age, H. CHICK, V. KORENCHEVSKY, and M. H. ROSCOE (*Biochem. Jour., 20 (1926), No. 3, pp. 622–631*).—Extensive data on the composition of the bones of rats on various diets of known composition are summarized and discussed. For purposes of comparison the animals whose skeletons were studied were classified in three groups, the first receiving a complete diet, the second a diet lacking in vitamins A and D but adequate in other respects, and the third a low-phosphorus, high-calcium, rickets-producing diet containing a moderate supply of vitamin A.

The chemical composition of the osteoporotic bones of the young rats on the diet deficient in fat-soluble vitamins alone was characterized by a proportion of fat (alcohol and ether-soluble material) in excess of the normal, a proportion of ash (A) less than normal, a normal proportion of organic material, cartilage, and connective tissue (R), and a ratio of A : R varying from 0.9 to 1.2 as compared with a normal value of about 1.5. Compared with this the bones of the animals on the low-phosphorus, rickets-producing diet were characterized by a content of ash (A) very much below normal, a water content much above normal, a slightly higher content of fat and organic material (R), and a very low value of the A : R ratio (from 0.4 to 0.8). In the bones of the rats receiving cod-liver oil in addition to the low phosphorus diet, the A : R ratio was 1.

"*If chemical examination is used in the diagnosis of rickets, the best criterion of defective calcification is given by the value of the A : R ratio, or the ratio of the amount of ash to the amount of organic material contained in the fat-extracted bone.*"

The white potato as a source of vitamin B, F. J. LYMAN and I. BLYSTONE (*Jour. Home Econ., 18 (1926), No. 4, pp. 199–204, fig. 1*).—On account of the fact that the data on the vitamin B content of white potatoes reported by Osborne and Mendel (E. S. R., 42, p. 759) were obtained with the older technique in which care was not taken to prevent access of the rats to their excreta, the authors have determined by the newer method of caging the vitamin B content of two varieties of white potatoes, an Early Ohio variety grown in Ohio and an unknown variety grown in Michigan. The basal diet used was that of Sherman and Spohn (E. S. R., 51, p. 868), modified by increasing the fat content and decreasing the starch to make a pasty mixture not easily scattered. The potatoes were boiled, peeled, riced, dried for 24 hours at a temperature not exceeding 70° C., ground through a 20-mesh screen, and incorporated in the diet in amounts of 5, 10, 20, 40, and 80 per cent, replacing equivalent amounts of starch.

Satisfactory growth was not secured on amounts up to and including 40 per cent. On 80 per cent good growth was secured. It is concluded that

"the white potato contains somewhat more vitamin B than is required for its own metabolism in the rat. If human requirements are of the same order, the white potato can not be depended on safely to make good any considerable deficiencies of vitamin B in other articles of the diet. With only 5 per cent of potato present, typical polyneuritis appears almost as soon as when vitamin B is absent from the ration."

A vitamin B deficiency manifesting itself for the first time in the second generation, I. A. MANVILLE (*Science, 64 (1926), No. 1654, pp. 256, 257*).—A preliminary report is given of evidence that on a ration furnishing insufficient vitamin B pregnant rats may show no evidence of this deficiency while the young develop symptoms of polyneuritis about two weeks after birth, although growing normally up to the onset of these symptoms. This is considered of significance as indicating that the maternal organism does not always deplete its store of the antineuritic vitamin to supply a sufficiency of it to the young, as well as furnishing further evidence that the growth-promoting vitamin B and the antineuritic vitamin are not identical. The failure to reproduce on diets deficient in vitamin B is thought to be due to this failure to transfer the necessary amount at the expense of the mother. The importance is emphasized of increasing the vitamin B (antineuritic) content of the diet during pregnancy and lactation.

The signs of health with special reference to nutrition, H. CHAPLIN (*Jour. Home Econ., 18 (1926), No. 9, pp. 485–492*).—In this paper presented at the American Health Congress, May, 1926, the author discusses briefly the outstanding clinical signs of health in children in respect to the eyes, color, teeth, hair, skin, fat, muscles, chest, extremities, foot-arch, position of foot, and weight. Under manifestations of a well-functioning body are discussed expression, muscular coordination, breathing, appearance of the tongue, bodily repose, freedom from fatigue, and good posture, with the influence of age upon some of these signs of health.

Basal metabolism in prolonged fasting in man, N. KLEITMAN (*Amer. Jour. Physiol., 77 (1926), No. 1, pp. 233–244, fig. 1*).—Data are reported on the basal metabolism during and after a 41-day fast undergone by the male subject in the previously reported studies of Kunde (E. S. R., 51, p. 67).

During the fasting period the body weight of the subject fell from 65.5 to 48.9 kg., a decrease of 25 per cent, and the basal metabolism from 1,517 to 978 calories per 24 hours, a decrease of 36 per cent. Calculated per kilogram of body weight, the heat production fell from 24.1 to 19.5 calories, a decrease of 19 per cent. The corresponding values per square meter of body surface were 904 and 639 calories and 29 per cent, respectively. When the subject resumed eating, the basal metabolic rate began at once to rise and at the end of one month was 1,570 calories per 24 hours. Following marked variations in the composition of the diet in the postfasting period there were decided differences in the metabolic rate. A high protein-high caloric diet appeared to have the most stimulating effect upon the basal metabolism.

Maternal diet and lactation, P. M. NELSON (*Jour. Home Econ., 18 (1926), No. 7, pp. 383–388*).—The work reported is essentially a repetition of the earlier studies of Hartwell (E. S. R., 52, p. 364) in which the conclusion was drawn that a lactating rat on a high protein diet produces milk which is poisonous to the young. The results obtained in the present study point to a lack of vitamin B rather than an excess of protein as the cause of the spasms noted in the young on the diets used, a conclusion substantiated by later work of Hartwell (E. S. R., 53, p. 163).

The nutritional requirements of nursing mothers (*Amer. Jour. Hyg., 6 (1926), No. 2, pp. 211–227, figs. 5; 228–237*).—In the first of these two papers

the effect of a deficiency of the antirachitic vitamin only, in the diet of the mothers, upon the development of rickets in the young, was studied by A. H. Grant and M. Goettsch. That the diet of the mother is an important factor in increasing or decreasing the resistance of the young to the effects of a deficiency of antirachitic vitamin in the diet of the young is shown in this investigation, in which female rats were kept in darkness on diets adequate except for being low in the antirachitic vitamin. Successive litters of these rats became more and more susceptible to rickets when fed a diet lacking in antirachitic vitamin, the rapidity with which the disease developed and the severity of the lesions depending upon the degree of depletion of the mother's reserves. By increasing the content of antirachitic vitamin in the mother's diet through cod-liver oil or an abundance of milk, the resistance of the succeeding litters was again increased. On a diet rich in antirachitic vitamin, the vitamin reserves were found to be sufficient to produce four successive litters showing normal resistance to a lack of this vitamin.

The effect of lowering both the antirachitic vitamin and calcium in the diet of the mother upon the development of rickets in the young was studied by Grant. As a result of the double deficiency the resistance to rickets was almost completely broken down in the fourth litter, and the progress of the disease was much more rapid.

The anti-rachitic properties of breast milk, C. KENNEDY and L. S. PALMER (*Soc. Expt. Biol. and Med. Proc., 23 (1925), No. 3, pp. 230, 231*).—In this preliminary note it is stated that the fat of breast milk from women on a diet furnishing an abundant supply of green vegetables, fruit, eggs, and milk and supplemented by a small daily dosage of cod-liver oil was found to be definitely antirachitic as judged by the line test on rachitic rats. In one case a composite sample of the fat of milk from three sources was fed at a level of from 15 to 20 per cent of the food intake. The second sample was fed at levels ranging from 5 to 25 per cent. At least 8 per cent was necessary to produce a distinct line test.

Irradiated orange juice: Its value as an antirachitic agent, H. L. MASLOW, D. H. SHELLING, and B. KRAMER (*Bul. Johns Hopkins Hosp., 39 (1926), No. 1, pp. 56–61*).—Preliminary experiments are reported showing that orange juice irradiated for 3 hours under a mercury vapor quartz lamp at a distance of 18 in. acquired sufficient antirachitic properties to initiate healing in rachitic rats in 5 days and to complete the healing in 15 days. The juice used was the commercial product, Mission Orange Juice, which was diluted with 2 parts of distilled water before irradiation. Further experiments are in progress.

The effect of ultraviolet irradiation on the health of a group of infants, L. H. BARENBERG, I. FRIEDMAN, and D. GREEN (*Jour. Amer. Med. Assoc., 87 (1926), No. 14, pp. 1114–1117*).—To determine whether systematic irradiation with ultraviolet light is capable of preventing respiratory infections and improving the general nutritive condition of young children during the winter months, some of the children in two wards of a large child-caring institution received daily irradiations for a period of 4 months, while others in the same wards and receiving the same diets were not irradiated. All of the children received liberal amounts of cod-liver oil and orange juice daily.

The chief improvement resulting from the irradiation appeared to be in the texture of the skin and the turgor of the muscles. There was an initial increase in weight, but this did not continue during the subsequent months. There was no decrease in the number of infections, nor did the irradiation protect against or lessen the severity of whooping cough. The hemoglobin count was not increased by irradiation, but the percentage rose with the lessening of infections in the spring.

Experimental rickets.—The effect of cereals and their interaction with other factors of diet and environment in producing rickets, E. MELLANBY ([*Gt. Brit.*] *Med. Research Council Spec. Rpt. Ser. No. 93* (*1925*), *pp. 66, pls. 40*).—This is the complete report of the investigations which have led the author to believe that cereals, particularly oatmeal, have a definite rickets-producing effect (E. S. R., 52, p. 367) through the presence in them of an unknown substance interfering with the normal deposition of calcium in the bones.

A test of indolinones as agents for prevention and cure of polyneuritis, R. A. GORTNER, L. S. PALMER, and S. J. DAHL (*Soc. Expt. Biol. and Med. Proc.*, *23* (*1925*), *No. 3*, *pp. 231–234*).—On the theory that the antineuritic vitamin may owe its properties to keto-enol isomerism, as suggested by Williams (E. S. R., 46, p. 864), β-methylindolinone and β-propylindolinone were tested for antineuritic properties by the Seidell constant weight method (E. S. R., 47, p. 408) and also by the curative method on polyneuritic pigeons.

In the first test β-methylindolinone was fed in amounts varying from 3 to 50 mg. every other day for periods of 6 to 18 days, with resulting loss in weight in all cases and with the development of polyneuritis in one of the pigeons receiving 10 mg. The same general results were obtained with β-propylindolinone fed to three pigeons in amounts of 15 mg. daily. Thyroxin fed in 2 mg. daily doses brought about rapid decline in weight.

The curative tests were on the whole inconclusive, although temporary relief from acute polyneuritis was obtained with β-methylinolinone after the ingestion of 100 mg. in two doses.

Discussion on food deficiency conditions in relation to preventable illness (*Brit. Med. Jour.*, *No. 3421* (*1926*), *pp. 185–194*).—In this symposium, held by the section of public health of the British Medical Association at its annual meeting in July, 1926, the general subject of food deficiency diseases, particularly pathological conditions attributable to lack of vitamins, was discussed from the scientific, clinical, tropical medicine, and public health points of view by S. J. Cowell, H. M. M. Mackay, P. W. Bassett-Smith, and J. Wheatley, respectively.

The composition of peanut meal and its use as a diabetic food, M. K. M. NEALE (*Jour. Amer. Dietet. Assoc.*, *2* (*1926*), *No. 2*, *pp. 73–85*).—Data on the composition of choice peanut meal, including the distribution of carbohydrates, are given as follows: Moisture 6.50 per cent, ether extract 10.50, alcohol extract 16.07, carbohydrate of alcohol extract as glucose 3.49, carbohydrate hydrolyzed by enzymes as glucose (other than alcohol extract) 3.19, carbohydrate hydrolyzed by acid as glucose (other than alcohol extract) 10.96, total hydrolyzable carbohydrate 14.45, utilizable carbohydrate 6.68, nonutilizable carbohydrate 7.77, pentosans 4.99, nitrogen × 6.25 51.56, ash 3.77, crude fiber 4.50, and undetermined by difference 8.72 per cent.

On account of the small amount of utilizable carbohydrate, as compared with 8.15 per cent for soy bean commonly used as a diabetic food and 75.01 per cent for wheat flour, a study was made of the possibility of using peanut meal in bread making as a substitute for wheat flour in proportions higher than those recommended by Johns and Finks (E. S. R., 43, p. 763). It was found possible to make a palatable bread with the substitution of peanut meal for as much as 50 per cent of the wheat flour by first toasting the meal and making it into a mush before mixing with the other constituents. This is estimated to reduce the available carbohydrate about 45 per cent (from 20 to 8.4 gm. per slice).

The use of standard diet formulas in the control of juvenile diabetes mellitus, J. D. BOYD (*Jour. Amer. Med. Assoc.*, *87* (*1926*), *No. 13*, *pp. 1020–1022*, *figs. 2*).—The system of dietary management of juvenile diabetes described in this contribution from the department of pediatrics, State University of Iowa,

has been designed to furnish the theoretical energy requirement of an active child, with 1 gm. or more of protein for each theoretical pound of body weight and potential glucose and fatty acids in a ration of 1:1.5. In the unit diet formulas selected to fulfill these requirements, protein, carbohydrate, and fat are supplied in the ratio of 7:9:21, respectively. To determine the needs of a patient the theoretical body weight is estimated from the standing height, using the Baldwin-Wood-Woodbury height-weight tables, and the theoretical caloric requirement for the weight is estimated from charts prepared from the Holt-Fales standards (E. S. R., 45, p. 162). In the selection of foods for these formulas, special attention has been paid to the mineral salts and vitamins. A specimen diet is given to illustrate the system.

As far as can be judged by clinical evidence extending over a year, the diets appear to be physiologically adequate. "It will require longer periods of observation before final conclusions may be drawn safely as to the adequacy of this system. It has seemed satisfactory from the standpoint of the patient's progress. From an administrative point of view it has greatly lessened the labor of diet calculation, and has permitted a comparative study of a large group of children of different ages on eqnivalent diets."

Diabetic diets for children, J. D. Boyd and M. V. Nelson (*Jour. Amer. Dietet. Assoc., 2 (1926), No. 1, pp. 45–51*).—This paper supplements the foregoing by additional diets calculated for use in this system of dietary management and applicable to diabetic patients throughout the period of childhood, the range in protein being from 28 to 105 gm. daily. A table expressing the quantitative relationship between height-weight calories for full activity and grams of protein for boys and girls up to 68 in. in height, and many practical suggestions for slight modifications in the diets to meet special needs are included.

TEXTILES AND CLOTHING

Textiles: A handbook for the student and the consumer, M. S. Woolman and E. B. McGowan (*New York: Macmillan Co., 1926, rev. ed., pp. XIV+572, pl. 1, figs. 143*).—A revision and enlargement of the book noted earlier (E. S. R., 30, p. 598).

Textile oils applicable in the dyeing and finishing of cotton, F. E. Burnham (*Amer. Dyestuff Rptr., 15 (1926), No. 18, pp. 709–712*).—The nature of some of the important textile oils is described, with the purposes for which they are best adapted.

Mildew in cotton goods, [I]–III (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 3 (1924), No. 26, pp. 295–306, pls. 4; 4 (1925), Nos. 12, pp. 129–150, pl. 1, figs. 4; 13, pp. 151–165, figs. 4*).—In the first of these three articles T. B. Bright, L. E. Morris, and F. Summers indicate several fungi, with favoring factors and conditions, which tend to lessen values in raw cotton or cotton fabrics. The effects of the activity of these organisms are also indicated, with means for their control. Present knowledge of antiseptics gives less encouragement than does knowledge regarding methods of sanitation and conditions of packing and storage.

The second paper, by Morris, deals with the growth of mold fungi on sizing and finishing materials. Seven fungi, obtained from cotton goods mildewed under ordinary conditions are described as studied in connection with nutrient materials present.

In the third paper a description is given by Morris of experimentation involving the growth of eight species of mold fungi on hard (strong) and on soft (weak) wheat flours which had been steeped during different periods, all these species having been isolated from cotton goods mildewed under industrial conditions.

The results as a whole support the general view that fermentation decreases liability to mildew, but they also emphasize the influence of specific differences which are discussed in this connection. The chemistry of the products of fermentation is discussed in relation to the growth of mold fungi.

The behaviour of flax yarns under repeated impacts, G F. New and A. L. Gregson (*Jour. Textile Inst., 17 (1926), No. 9, pp. T437–T452, figs. 7*).—Consideration of the tensile stresses imposed on warp yarns by loom motions indicates that the maximum stress induced in each individual warp thread depends on its extension properties, and that besides strength and regularity high recoverable extensibility is to be sought in yarns for good weaving quality rather than a large total extension to breaking strength. The effects of repeated impacts by a falling weight on a flax yarn are discussed, and experimental apparatus for such treatment is described.

The progressive extension of a yarn receiving repeated impacts was shown to be irregular, but a smooth curve could be had from the means of observations of 20 specimens. This mean curve is of the same general form, very closely logarithmic, for all flax yarns and under all conditions examined. The mean extension is rapid with the first few impacts and gradually becomes slower but never decreases to 0. The number of unbroken specimens decreased with the number of impacts applied, rapidly at first and more slowly later, the order of superiority being green yarn sized, green yarn, boiled yarn sized, and boiled yarn. Changes in the tensile strength of a yarn due to repeated impacts were insignificant, and fractures occurring on the application of repeated impacts seemed due in part at least to the gradually lessening extensibility of the yarn. This necessitates an increasing maximum tension for the absorption of the constant energy of impact until the breaking strength is reached.

The gel structure of the wool fibre, J. B. Speakman (*Jour. Textile Inst., 17 (1926), No. 9, pp. T457–T471, figs. 5*).—According to studies at Leeds University, the wool fiber possesses a true yield point and after extension remains permanently more extensible at low tension. "The behaviour of a wool fibre under stress is the behaviour of a single cell, which consists essentially of three phases, (1) the elastic cell wall, enclosing (2) a fibrillar structure which is not in physical equilibrium with (3) a viscous phase of gelatinous character included in its interstices." These observations seemed to necessitate fundamental changes in Shorter's[1] views on the internal mechanics of fibers.

The extension of wool fibres under constant stress, J. B. Speakman (*Jour. Textile Inst., 17 (1926), No. 9, pp. T472–T481, figs. 6*).—Investigation confirmed views expressed above concerning the gel structure of the wool fiber. The existence of a definite yield point was demonstrated, and the occurrence of a second point of inflexion on the stress-strain diagram for wool was shown to be independent of the rate of loading. Andrade's[2] expression for the rate of extension of metal wires under constant stress applied equally well to wool fibers, and the data given enabled the calculation of the extension and rate of extension of English Cotswold wool at 15° C. in saturated air under any stress. The gelatinous phase in the wool fiber was shown to vary in composition from one wool to another and to change in viscosity with temperature.

Merino wool classing, P. D. Rose (*Wool Rec. [Bradford], 30 (1926), Nos. 899, pp. 366–371; 900, pp. 433–438; 901, pp. 499–504*).—The objects and methods

[1] An Investigation of the Nature of the Elasticity of Fibres, S. A. Shorter. Jour. Textile Inst., 15 (1924), No. 4, pp. T207–T229, figs. 14.

[2] On the Viscous Flow in Metals and Allied Phenomena, E. N. da C. Andrade. Roy. Soc. [London], Proc., Ser. A, 84 (1910), No. A 567, pp. 1–2, figs. 8.

of classing wool are outlined, with the classing standards adopted in South Africa in May, 1924.

Notes on the determination of the dry weight of wool, S. G. BARKER and J. J. HEDGES (*Jour. Textile Inst., 17 (1926), No. 9, pp. T453–T456*).—The commercial regain in moisture content of wool as determined by a conditioning house using a type of oven in which the air is preheated and forced through the wool at a temperature of 235–240° F. was about 0.5 per cent low as compared with the true regain (e. g., 15.5 instead of 16 per cent). The ordinary commercial gas and electric ovens tested gave a figure about 1 per cent low.

Tar on wool, A. T. KING and R. J. SMITH (*Wool Rec. [Bradford], 30 (1926), Nos. 908, pp. 973–978; 909, pp. 1041–1046, figs. 8*).—In this contribution from the British Research Association for the Woollen and Worsted Industries, the sheep-marking problem is reviewed from the viewpoints of the wool grower, the maker of sheep-marking materials, and the wool manufacturer. The tests reported were made upon a number of commercial branding agents and 40 experimental fluids with regard to their injurious effects and ease of scouring out. Formulas suitable for Great Britain and for warmer climates are indicated. It is suggested that a ban on all black marking materials would effectively stamp out the use of tar.

Colour problems in the woollen and worsted industries, S. G. BARKER and H. R. HIRST (*Jour. Textile Inst., 17 (1926), No. 10, pp. T483–T510, pls. 4, figs. 7*).—The status of color or colored pattern in textile materials is surveyed from physical, chemical, technical, and trade points of view, together with citations of the results of practical work in the laboratories of the British Research Association for the Woollen and Worsted Industries at Leeds. The main questions considered are the choice of standard illumination, the fastness and durability of a color to the influence of external conditions, and the determination of the exact shade of a color and its numerical representation.

Effect of dry cleaning on silks: A comparison of the effect of dry cleaning and some service conditions on the strength of silk, M. H. GOLDMAN, C. C. HUBBARD, and C. W. SCHOFFSTALL (*U. S. Dept. Com., Bur. Standards Technol. Paper 322 (1926), pp. 605–634, figs. 17*).—A study of tin-weighted and unweighted samples of silk after various treatments and exposures to sunlight and storage at standard conditions (of 65 per cent relative humidity at 70° F.) led to the following conclusions:

No deterioration results from exposures to standard atmospheric conditions over a period of 2.5 months, even when acid or alkaline perspirations are applied. Sunlight exposure causes a marked deterioration in both unweighted (but dyed) and tin-weighted silks, the loss in strength in 100 hours' exposure amounting to about 25 per cent for unweighted and about 50 to 75 per cent for weighted silks. Acid and alkaline perspiration treatments increase the deterioration when sunlight exposures are given, so that the loss in strength in 100 hours' exposure is about 35 per cent for unweighted and about 65 to 100 per cent for weighted silk. In no case did dry-cleaning solvents cause any appreciable deterioration of the silk fabrics.

Fifty-fourth annual report of the Silk Association of America (*Silk Assoc. Amer. Ann. Rpt., 54 (1926), pp. 143, figs. 9*).—This gives an account of the organization and its activities during 1925, and includes reports on different phases of the silk industry in addition to silk statistics.

NOTES

Florida Station.—Dr. Marion N. Walker, for two years pathologist with the Tropical Plant Research Bureau in Cuba, has been appointed assistant cotton specialist beginning December 1, 1926. He will continue certain physiological studies of cotton already under way and will also inaugurate a number of pathological studies.

Jackson B. Hester, assistant chemist at the Texas Station, has been appointed assistant chemist in connection with the studies of soil chemical problems.

Georgia College.—A special school of cooperative marketing was held January 24 to 28. The school was conducted by the college, assisted by the cooperative associations of Georgia and the Division of Cooperative Marketing of the U. S. Department of Agriculture.

Emphasis was placed on problems in business management and membership relations. The program was designed especially for directors and employees of cooperative associations, county agents, and agricultural workers, bankers, farmers, and others interested directly in the operations of cooperative marketing organizations. The list of lecturers and speakers included representatives of the college, specialists from the U. S. D. A. Bureau of Agricultural Economics, and the general managers of cooperative associations handling cotton, peaches, watermelons, apples, pecans, sirup, peanuts, and other commodities.

Kansas College and Station.—State appropriations aggregating $1,444,500 for 1927–28 and $1,362,500 for the succeeding year are to be requested by the board of regents, together with $101,840 per annum for the duplication of Federal funds for extension work in agriculture and home economics and $58,782.78 for the reimbursement of certain funds depleted in 1922. The principal items of increase are those of $97,000 per annum for salaries, partly for additional employees and partly for promotions, $375,000 for a new power plant, $49,900 additional per year for maintenance, $20,000 per year additional for improvements and repairs, $60,000 for equipping the new library and $24,000 for remodeling the old building, $2,000 for the purchase of land, $21,000 for campns roads, walks, and lights, and $20,000 per year for laboratory equipment and improvements. The estimates for the substations include $32,000 in 1927–28 and $29,500 in 1928–29 for the work at Hays, $2,500 of which is for new machinery, $11,700 and $11,500 for that at Garden City, $6,000 and $5,750 for that at Colby, and $3,500 and $4,000 for that at Tribune.

Missouri University.—Because of the gratifying attendance in 1926, another special four-day course for graduate veterinarians was offered from January 25 to 28. Special attention was given to sterility and other diseases in cattle, poultry diseases, tuberculosis, and abortion in cattle and hogs. Opportunity was also afforded for instruction in related lines, such as animal feeding, poultry culling, and dairying.

A portrait of the late Dr. Henry J. Waters, former dean of the College of Agriculture, was recently unveiled in the library of the College of Agriculture and presented to the college as the gift of members of the faculty and a number of the alumni.

New York State Station.—Three new varieties of apples and three of grapes, constituting an exhibit of the work of the fruit breeders at the station, were awarded the Marshal P. Wilder medal for new fruits at the last annual meeting of the American Pomological Society. The station collection included the Cortland, Orleans, and Sweet Delicious apples and the Sheridan, Urbana, and Golden Muscat grapes.

Oregon College and Station.—According to a note in *Oregon Countryman*, Donald D. Hill has been appointed instructor in farm crops and assistant agronomist.

Pennsylvania College and Station.—Dr. J. R. Haag, assistant professor of agricultural and biological chemistry, has resigned to accept an appointment in the Oregon Station.

Rhode Island College and Station.—Dr. Henry G. May, since 1920 professor of bacteriology in the college and head of the research work in animal breeding and pathology, died December 23, 1926, at the age of 40 years. Dr. May was born in Germany, graduating from the University of Rochester in 1913, and receiving the Ph. D. degree from the University of Illinois in 1917. He had also served as junior zoologist with the U. S. D. A. Bureau of Animal Industry, bacteriologist in the U. S. Army, and professor of biology in Mississippi College.

Utah College.—According to a note in *School and Society*, Miss Christine B. Clayton, assistant professor of foods and dietetics, has been appointed a fellow of the Laura Spelman Memorial Foundation and will study at the University of Minnesota and Columbia University.

Wisconsin University.—Dr. E. J. Kraus, professor of applied botany, has accepted an appointment in the University of Chicago.

Northeastern Forest Experiment Station.—Samuel T. Dana, director since the establishment of the station three years ago, has been appointed provisional dean of the new School of Forestry of the University of Michigan.

Agricultural Research in Australia and New Zealand.—An act passed by the Australian Commonwealth Legislature last June provides for a Council of Scientific and Industrial Research and a system of State committees, with three representatives appointed by the Governor General and as the representative of each of the six States the chairman of its State committee. The representative of New South Wales is J. D. Watt (agriculture) and of South Australia T. B. Robertson (physiology).

Annual estimates for the special work of the year must receive the sanction of the Commonwealth Parliament in the usual manner, and £50,000 has been requested for the current year. The sum of £250,000 has also been set aside as a trust account, the capital and interest of which are to be used for scientific and industrial investigations, and an endowment fund of £100,000 has been established to assist individuals in scientific research and train students for undertaking it. Under the latter provision an interchange of students with Great Britain is being worked out.

The field work of the council in the immediate future will include studies of cold storage problems, with special reference to beef in cooperation with the British Food Investigation Board; the utilization of forest products; diseases and pests of cattle, sheep, and horses, including blowflies and buffalo flies; and attempts to check the spread of prickly pear, which has now overrun 29,000,000 acres.

In New Zealand an advisory council of scientific and industrial research is to be formed. An agricultural college is to be built and an institute of dairying established to collaborate with it.

British Aid to Agricultural Education and Improvement in China.—A report has recently been made to Parliament by a committee appointed to

advise the Secretary of State for Foreign Affairs of Great Britain as to the best methods of applying the so-called "Boxer Indemnity" to purposes "beneficial to the mutual interests of His Majesty and the Republic of China." This report, which is based on a study of the situation in China, recommends the immediate expenditure, from the total of about £11,000,000 which is estimated to be available between 1922 and 1945, of about £350,000 per annum and the investment of the remainder to provide a permanent fund upon the cessation of the Chinese indemnity payments. Of the amount scheduled for immediate expenditure, it is recommended that 30 per cent, or approximately £100,000 per annum, be devoted to agricultural education and improvement, this including 5 per cent for famine relief and rural credit. An additional 23 per cent would be devoted to scientific research through the establishment of a national research institute, 17 per cent for medical and public health work, and 30 per cent for educational purposes. The agricultural program proposed would include the establishment of agricultural colleges, scientific research into silkworm culture, and the formation of an institute of rural economics.

American Society of Animal Production.—The annual meeting of this society was held in Chicago on November 26 and 27, 1926. The attendance was large, and the papers represented approximately 20 experiment stations, the U. S. Department of Agriculture, and commercial organizations. Special interest centered around the cooperative study of Factors Influencing the Quality and Palatability of Meat.

The program was opened with an address of President H. P. Rusk, in which the necessity of cooperation between different specialized departments was pointed out as an aid to the proper interpretation and solution of investigations having a bearing on several sciences. Several papers followed relating primarily to the protein and mineral metabolism of animals. These included the results of a study of the mineral requirements of dairy cows by J. B. Lindsey and J. G. Archibald, Calcification Studies with Menhaden Fish Meal, by L. A. Maynard and R. C. Miller, and The Value of Different Carriers of Phosphorus in Mineral Mixtures for Swine, by W. L. Robison. E. B. Forbes presented a paper on The Variability of the Computed and Directly Determined Fasting Katabolism of Cattle, while J. M. Evvard discussed The Protein Requirements of Fattening Cattle as determined from an analysis of investigations conducted at the Iowa Station. One of the outstanding contributions was that of H. H. Mitchell, T. S. Hamilton, and R. L. Zimmerman dealing with the Determination of Connective Tissue in Meats. Analyses were presented in this paper of the total nitrogen, collagen nitrogen, and elastin nitrogen found in various duplicate samples of beef, pork, and chicken. The method suggested for the determination of the connective tissue proteins included the separation of the soluble nitrogen by grinding the meat with water and filtering through a fine mesh sieve. The collagen was removed by steaming in an autoclave, and the remaining nitrogen was digested through the residue by trypsin. That portion remaining was considered as elastin.

The society was divided into three luncheon sessions dealing, respectively, with extension work, disease resistance, and feeding experiments. At the first of these the topics included Problems of Shrinks and Fills in Livestock Marketing, by E. N. Wentworth; The Livestock Man's Concern in the Corn Borer Infestation, by C. W. Gay; The Missouri Beef Herd Demonstration Work, by J. W. Burch; Recent Trends in the Export of Livestock Products, by D. M. Strall; and When Should an Owner of Livestock Be Considered a Breeder in the General Acceptance of the Term "Breeder"? by J. W. Wilson.

At another session E. Roberts gave a paper on The Inheritance of Resistance to Disease, which was essentially a progress report of the endeavor to select chicks resistant to bacillary white diarrhea at the Illinois Station. At the third session the papers included Wintering Steers with and without Corn Silage Preparatory to Finishing on Grass without Grain, by E. S. Good; Corn and Cob Meal for Fattening Baby Beef Calves, by H. W. Vaughan; A Comparison of Roughages Supplemented with Cottonseed Meal as a Concentrate, by W. L. Blizzard; and The Influence of the Addition of Oats to a White Corn Ration in Growing and Fattening Hogs, by E. A. Livesay and E. C. Stillwell. G. Haines also discussed the methods employed in the planning and conduct of feeding experiments.

At the afternoon session the accuracy to be gained in weighing cattle on three days instead of one at the beginning and end of a feeding experiment was shown by J. L. Lush and W. H. Black to be less than is ordinarily considered. An analysis by H. C. McPhee of the sex ratio and frequency of sex combinations among the individuals listed in two swine herdbooks and in experimental herds indicated that inaccuracy of a certain type was quite common in the herdbook data, making their use in genetic studies somewhat questionable. E. W. Sheets briefly discussed the cooperative project relating to the factors influencing the quality and palatability of meat from the standpoint of its influence on animal husbandry research, especially the progress which it has made and the expectation for bigger things from it. P. E. Howe presented a scale for color which has been prepared for use in this study. Other papers presented at this session included those by W. J. Loeffel dealing with the relation of light to the calcification of bone, and the rate of growth of swine, by H. J. Gramlich, in which no particular favorable effect was found to result from spaying heifer beeves, by F. S. Hultz dealing with the ability of the judge to determine differences in characteristics of the fleeces of Rambouillet sheep, by G. Bohstedt in which baby beeves were found to feed better as a group than when fed alone in stanchions, and by M. A. R. Kelley on the length of the stabling season.

The evening session included several papers on conditions in Denmark. E. F. Ferrin discussed particularly the type of swine and methods of swine production as practiced in Denmark, and T. U. H. Ellinger showed motion pictures of the Danish Agricultural College and three reels of films portraying different portions and conditions of Denmark as prepared by the Danish Government.

A feature of the society's banquet was the serving of rib roasts from prime and good carcasses. Each person received a portion of a similar cut from the two carcasses and was requested to grade each for tenderness, juiciness, and flavor. From a discussion of the results led by P. E. Howe there appeared to be much diversity of opinion, especially with relation to the flavor of the meat. Miss L. A. Alexander had previously described the desirable method of roasting meat and the uniform type of roasting practiced in the cooperative studies of the factors affecting the quality and palatability of meats.

The session on the following morning dealt largely with extension problems, and that afternoon committee reports and other business were taken up. E. S. Good was elected president, E. W. Sheets vice president, and J. R. Wiley secretary-treasurer of the society. P. Gerlaugh and C. W. McDonald were elected president and secretary, respectively, of the extension division.

It has been customary for a number of years for the society to honor some outstanding individual, and the meeting was concluded by a dinner in honor of Dr. J. R. Mohler, Chief of the Bureau of Animal Industry of the U. S.

Department of Agriculture. At this dinner the achievements of Dr. Mohler and the character of his service to the livestock and meat industry were set forth by A. Eichhorn, R. F. Eagle, E. W. Sheets, and Assistant Secretary of Agriculture R. W. Dunlap. Dr. Mohler responded with a paper dealing with the interrelation of disease control and animal husbandry problems. The stock-judging team from the Oklahoma college, which won the intercollegiate contest at the 1926 International Livestock Exposition, was presented, and prizes were awarded for the Saddle and Sirloin essay contest, written on the subject of the contribution of livestock to stability in farming. An innovation which is expected to be continued was a roll call of the stock-judging teams of 1907.

Fifth International Congress of Genetics.—This congress will be held in Berlin from September 11 to 18, 1927, immediately following the Zoological Congress. The six morning sessions are to be opened with an address by some authority who will present a comprehensive account of the present status and future outlook of his special phase of research. The remainder of the session will be devoted to papers of from 20 to 30 minutes each. At the conclusion of the conference, excursions to Potsdam, Halle, and some of the plant breeding centers are planned.

New Journals.—*Iowa State College Journal of Science* is being issued as a quarterly of research. The purposes in mind are set forth as follows: To furnish a medium for the prompt publication of the results of research, to give opportunity for the publication of preliminary notes, to afford space for the publication of some articles of greater length than can usually be accepted by special journals, to give a publication channel to such results of workers on the research staffs as are scarcely long enough to warrant publication as separate bulletins, and to provide for the prompt publication of certain of the doctoral dissertations. The initial number contains the following articles: Linked Inheritance in Tomatoes, by E. W. Lindstrom; Taxonomic Studies on Soil Fungi, by F. V. Abbott; The Relation Between pH and the Reaction of Aqueous Solutions at Various Temperatures, by E. I. Fulmer; Geographical Variation in the Nigricornis Group of Oecanthus (Orthoptera), by B. B. Fulton; Nomogram for Determination of Generation Time and Velocity Coefficients for Rates of Growth or Death, by R. E. Buchanan; and A Study of Crown Gall Caused by *Pseudomonas tumefaciens* on Rosaceous Hosts, by J. H. Muncie.

Archivio Botanico is being published as a quarterly bulletin of the Botanical Institute of the University of Modena. Special emphasis will be given to systematic, phytogeographic, and genetic phases of botany. The initial number contains an article by A. Béguinot and C. Mezzatesta entitled A Biometric Study of Variability in the Ligulate Flowers of *Bellis perennis* L. and *B. annua* in Sicily and Calabria, and another by F. Panini entitled The Chemical Constitution of the Cellular Membrane in the Myxophyceae.

Studi e Notizie is a quarterly issued by the Institute of Economics and Agricultural Statistics at Rome. The initial number contains several original articles, statistics for agricultural and forest products, and data relative to the institute and its work.

Anales de la Facultad de Ciencias is being published from time to time at Lima, Peru, by the University of San Marcos. The initial number contains a number of contributions of general scientific interest.

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EXPERIMENT STATION RECORD

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Efforts to facilitate the prosecution of agricultural research on a national scale and by cooperative effort continue to receive attention as never before. A revised edition of the mimeographed pamphlet outlining national problems for cooperation by the experiment stations and the United States Department of Agriculture has just been issued by the joint committee on projects and correlation of research of the Association of Land-Grant Colleges and Universities. This revision adds to the original edition data as to projects worked out in 1926 under the auspices of the committee on such questions as agricultural surpluses, a modification of the rural home management studies on food consumption and expenditures of farm families, and a new project on standards of living and expenditures of farm families. Supplementing as it does the numerous projects previously set forth by the committee on marketing, the vitamin content of food, the use of time by farm home makers, the efficiency studies of the household plant, the group of projects on rural social organizations and agencies, and the comprehensive project on the factors which influence the quality and palatability of meat, an impressive showing of opportunities is presented in a number of important directions.

Interest in the matter, however, is by no means confined to the fields of inquiry selected by the association. The problem of assisting research in still another line has been taken up by agencies concerned with agricultural engineering, and a report has recently become available in mimeographed form which deals with the status of studies of mechanical farm equipment. This report has been issued by the Department of Agriculture and embodies the findings obtained in an inquiry instituted by an advisory council of 20 members appointed in 1925 to represent the National Association of Farm Equipment Manufacturers, the American Society of Agricultural Engineers, and the Department. The work was performed under the direction of Prof. J. Brownlee Davidson while on leave of absence from the Iowa State College under an appointment in the Bureau of Public Roads.

The objective of the survey was the formulation of a national cooperative and coordinated research program in the United States between Federal, State, commercial, and private agencies. In an effort to attain this objective, the existing status of research into farm equipment as revealed in current experiment station projects was reviewed, visits were made to and conferences held with 45 State experiment stations and several commercial laboratories, and suggestions as to problems needing investigation were obtained from members of the participating organizations. The data so obtained have been summarized and discussed, and as an aid to the organization of projects there have been appended to the report an agricultural engineering classification of subject matter and examples of a number of typical research project outlines.

The summary of research now in progress was prepared by Mr. R. W. Trullinger, agricultural engineer of the Office of Experiment Stations. It reveals a total of 143 projects, of which 130 are being conducted by 27 agricultural experiment stations, 12 by 6 engineering experiment stations, and 1 by a State normal school. As would be expected, the majority of these projects are dealing directly with mechanical farm operating equipment and are carried on exclusively or cooperatively by engineering departments, although a few are intrusted to departments of agronomy, agricultural economics, and similar branches. At many stations the number of projects is comparatively small, but a total of 37 are in progress at the stations in California, Kansas, and Illinois. The classified list of these projects reveals a wide range of subjects, the largest number centering around the use of electricity on farms.

Much interest was reported in the outlining of needed experimentation. Over 800 suggestions were received by the committee, and from these a classified list of over 400 topics has been compiled. This list includes both basic problems to ascertain the scientific soundness of the various farm operations involved in production and problems of efficiency and economy in which improvements are sought in existing methods and machines. Here, too, the range of subjects is wide, and the council has not deemed it practicable to attempt to point out their relative importance or urgency.

The need of cooperation in undertaking many of these subjects is emphasized, and the relation to a national research program of the farm equipment industry is discussed at some length. It is pointed out that thus far much of the agricultural investigation which has been carried on "has not extended into those phases of experimental research where the new knowledge is applied and organized into productive systems of farming, but has been left almost entirely to the practical farmer and machine manufacturer.

During the early periods of the growth of the farm equipment industry, when agricultural research was in its infancy, the design and production of equipment was much in advance of agricultural research. However, in the last three-quarters of a century the situation has changed materially. A mass of agricultural knowledge is available waiting for utilization, and the demand for better practice is acute."

It is concluded that if full advantage is to be taken of all resources making for advancement some working plan for correlated effort is called for. "This view, it appears, is that of the American manufacturer. It is not expected that the public research agencies shall undertake to design farm machines or to indicate how they may be produced, but rather to set forth the principles of agricultural production and the essential requirements of best farm practice upon which the design and production of machines must be based. For instance, if the essentials of a good seed bed can be clearly defined, then it is the obligation of the producer of machines to provide the equipment which will enable the desired results to be attained. Or if the principles involved in the control of injurious weeds are determined and proved, the furnishing of equipment to utilize these principles is a duty of the manufacturing industry."

Because of the necessity of carefully guarding the freedom of education and research and insuring their independence of commercialism, it is concluded that an industry vitally concerned with agricultural progress has been more or less isolated from the work of public investigational agencies in this country. The present movement is described as "an earnest effort to improve the present situation and to arrange for such a working arrangement as will make for economy and efficiency of effort and insure rapid progress." However this may be, the attempt to stimulate and encourage experimentation in this field is of much significance and promise. If a program of coordinated attack upon the many important problems awaiting solution can be formulated and carried through to completion, the undertaking should be productive of much good.

For many years it has been the endeavor of the Office of Experiment Stations to obtain as complete and comprehensive information as has been available concerning the progress of agricultural education and research in foreign countries. This duty has been carried on in the belief that developments abroad are not only of general interest but often of direct value to workers in this country. It is a truism that science knows no boundaries, and it is equally clear that to the investigator acquaintance with the status of existing knowledge is of outstanding importance. For this reason news notes

of foreign institutions and their personnel are being collected wherever possible as a means of developing closer relationships, and it is hoped that sufficient data may ultimately become available to permit of a revision of the publication issued by this office in 1902 describing the organization and work of the experiment stations of the world. Additional information along these lines is greatly desired, and assistance from travelers and others having first-hand information of conditions abroad will be most welcome.

Opportunity has recently been afforded to gain an insight into the agricultural conditions prevailing in the ancient but little-known realm of Persia. Some time ago a commission of enquiry into the production of opium in Persia was constituted by the League of Nations, and while the United States was not officially connected with this undertaking the presidency of the commission was intrusted to an American citizen, Mr. Frederic A. Delano. The international significance of the subject lay in the possibilities of ultimately eradicating the traffic in opium. Of late much of this opium has been grown in Persia, and in certain portions of that country the culture of the opium poppy has become the principal agricultural enterprise.

It was early realized that if undue economic hardship was to be avoided an important factor in any prohibition of opium production would be the question of substituting other remunerative crops for the region. Information on this matter was virtually lacking, and the commission sought the services of an agricultural expert for a study of the situation. Eventually there was selected to carry on this work Mr. Jewell B. Knight, a graduate of the Massachusetts Agricultural College and widely known for his services to Indian agriculture as its first agricultural missionary and the principal for many years of the Government Agricultural College at Poona. A mimeographed report of his findings based on a survey of some months and entitled The Existing State of Persian Agriculture; Opportunities for Improvement and Suggestions as to How They can be Effected, has recently been issued.

The report is noteworthy not only as a contribution to existing information and as an example of a careful and conscientious survey but for the clear intent to formulate specific recommendations which would prove practicable under the economic conditions prevailing. These conditions are both numerous and complex, involving wide variations and extremes in climate, a precarious water supply, lim- whn areas of desirable soils, inadequate transportation facilities, prim- experi nethods or agriculture, and a distinctly unprogressive but organize ntrenched economic and social system. Under all these almost ent the development of a prosperous agriculture is an under- oic proportions.

The introduction of improved strains of farm crops and domestic animals, the provision of suitable agricultural machinery and better roads, the greater use of legumes and other promising crops, and the further extension of such phases of agriculture as sericulture, rose growing for perfumery, cruciferous and other oil crops, flax and millets, and the development of animal husbandry and dairying are suggested as remedies. Attention is also called to the need of providing a new system of land tenure and improved credit facilities.

A final chapter deals with institutions for effecting improvements in agriculture. In the words of the report, "if Persian agriculture is to be developed along modern lines and avail itself of the results of recent scientific research, an efficient agricultural department is sine qua non. This department's first duty is the formulating of a comprehensive plan for the development of the department and the improvement of Persian agriculture to extend over a period of years, due consideration being given to the size of the available budget and to the priority of the different undertakings. The work of the department will naturally fall under three heads: (1) Education (both of staff for its use and for villagers), (2) experimentation, (3) demonstration. A fourth branch, the establishment of seed growing farms and stock farms for raising breeding animals, may, as funds become available, be included in the work of the department. The most important condition of success in this plan will lie in the personnel of the staff in all grades."

As regards agricultural education, the immediate need is seen less for institutions to teach the theoretical side of the subject now covered by the Agricultural School of Teheran than for the training of practical workers. A system of vocational schools distinct from the general agricultural system is advocated, in charge of a director who has had both agricultural and educational training and with its most important duty " to establish and maintain a training school for assistants in the various branches of the department." Here, too, emphasis on the practical side is stressed. "Work must be actually performed, each student doing it with his own hands and not as was seen at Karedge by following a laborer and taking notes."

Before launching upon any radical agricultural change, preliminary experiments as to their adaptability to the region are deemed essential. "For this purpose numerous experimental stations or plats will be needed. These, however, need not be and should not be fixed institutions with expensive staffs and equipment, but each should be instituted to settle some definite question or questions, and as soon as the problems have been solved, the staff and budget should be allotted to other problems in other places.

"The problems should be very definitely visualized, and only such problems should be attempted as can be solved within a comparatively short time—one or two seasons—with simple apparatus

and by workers who, though well trained, are not of necessity highly educated. The more exact and comprehensive scientific investigations should be postponed until the simpler and more important questions as to the adaptation of methods and varieties to the different regions have been settled."

Despite the elementary nature of the experimental work advocated, a clear distinction is drawn between its function and that of demonstration. "The worker in the experiment branch of the department requires considerable scientific knowledge as well as a thorough practical training, and should form habits of accuracy, truthfulness, and careful observation. Experimenters are born and not made. Students in training for work in this branch who show no aptitude should be transferred to some other branch. The prospects of the efficient experimenters should be so favorable that talent of this kind would not be wasted in administrative or demonstration work.

"Once an improvement of any kind, whether it be a new method, an implement, a new crop or variety, has been tried by the experimental branch and proved beyond reasonable doubt as suitable to some tract, the real work of the department begins in securing its adoption by the farmers. Telling them about any such innovation is not effective; only actual demonstration in the place where the change is to be made will produce the desired results. Demonstration plats and itinerant demonstrators are the most efficient agents for this purpose. The demonstration plat should be even a simpler affair than the experiment station, and should be moved about as soon as the suggested improvement has been adopted by a number in the immediate vicinity. Usually one, or a very few, new things should be demonstrated at a time."

Throughout the report an effort is made to emphasize those phases of the existing situation which appear to be capable of improvement by comparatively simple and inexpensive measures. Many of the suggested changes, it is thought, could be inaugurated at once, but most "must be achieved by the slow and steady following of a well-formulated plan." Whether the opportunity will be afforded to test such a plan can not be predicted, as the functions of both the agricultural expert and the commission itself were evidently mainly advisory. In any event, however, the report is to be commended as an example of careful and comprehensive observations and their utilization as a basis for clear-cut and positive conclusions and suggestions. The survey is thus much more than a collection of data or a summary of existing knowledge. It furnishes a definite program of action which is directly applicable to the immediate end in view. As such, and without reference to the merits of its program, it is worthy of study as a contribution to the larger problem of the most suitable methods of inquiry into agricultural questions in general.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The chemistry of cellulose and wood, A. W. Schorger (*New York and London: McGraw-Hill Book Co., 1926, pp. XIV+596, figs. 13*).—"It is the aim of this book to cover completely the scientific and empirical data available on the chemistry of wood. This has necessitated the inclusion of cotton cellulose and its modified forms. Industrial processes are treated mainly from the side of the fundamental reactions involved." The greater part of the volume is devoted to the chemistry of lignin, hemicelluloses, and wood cellulose, and the constitution of cellulose, its colloidal properties and derivatives, pulp processes, and products of distillation. Chapters 14 and 15 on the fermentation of cellulose and wood by bacteria and filamentous fungi and on the digestion of cellulose and wood by animals are of particular interest from the standpoint of agricultural chemistry. The final chapter on analytical methods consists of a critical discussion of the methods which have proved most serviceable for determining the various constituents and groupings in wood and allied substances. Abundant references to the original literature are given as footnotes throughout the volume.

The chemistry of wood, L. F. Hawley and L. E. Wise (*New York: Chem. Catalog Co., 1926, pp. 334, figs. 19*).—In this monograph emphasis has been placed on the results of purely scientific investigations in wood chemistry rather than on the practical phases of chemical wood utilization. The arrangement of subject matter consists of sections on the chemical components, proximate and summative analyses, and decomposition of wood, and on wood as an industrial material. This final section deals particularly with the physical properties of wood, such as its microscopic structure, penetrability to liquids, etc., and the deterioration of wood under various conditions of use. Numerous literature references are given as footnotes.

The chemistry of the natural and synthetic resins, T. H. Barry, A. A. Drummond, and R. S. Morrell (*London: Ernest Benn, 1926, pp. VII+196, figs. 3*).—This volume, which is one of the series of monographs on oil and color chemistry edited by R. S. Morrell, deals with the origin, methods of collection, physical and chemical properties and uses of the natural resins and with the properties and manufacture of synthetic resins and the fundamental principles of resinification.

The lime sulphur-calcium arsenate spray, W. Goodwin and H. Martin (*Jour. Agr. Sci. [England], 16 (1926), No. 4, pp. 596–606*).—Using methods similar to those of a previous investigation of the possible chemical changes taking place when lead arsenate is mixed with lime sulfur (E. S. R., 54, p. 709), the authors have studied the reaction between lime sulfur, dicalcium arsenate, and commercial calcium arsenates. From the results reported the following general conclusions have been drawn:

The interaction of calcium hydroxide and dicalcium arsenate results in the formation of a continuous series of basic calcium arsenates which are hydro-

lyzed in aqueous suspension. Although this reduces the amount of arsenic in solution, the reaction is temporary, the original solubility of the dicalcium arsenate being restored by exposure to atmospheric carbon dioxide. The concentration of soluble arsenic in the dicalcium arsenate lime spray is, however, not as great as in the dicalcium arsenate spray, and there is consequently less risk of spray injury with the former.

The concentration of soluble arsenic in the dicalcium arsenate and lime spray is reduced by the admixture of lime sulfur. The precipitation of sulfur from the calcium polysulfides of the lime sulfur is not affected by the addition of dicalcium arsenate, but may be decreased by the addition of lime to an extent dependent on the rate of carbonation of the free lime on the leaf surface.

The chemistry of wheat flour, C. H. Bailey (*New York: Chem. Catalog Co., 1925, pp. 324, pl. 1, figs. 21*).—Following a brief historical introduction, the extensive literature on the chemistry of wheat flour is reviewed in relation first, to the effect of various factors such as growth, maturity, environment, and storage on the chemical composition of the wheat kernel; second, to the changes in composition resulting from processes of manufacture or milling; and third, to the effect of variations in the composition of the flour upon its baking qualities. An extensive bibliography is appended.

The water-soluble content of calcium and phosphorus in cabbage, W. H. and C. B. Peterson (*Jour. Agr. Research [U. S.], 33 (1926), No. 7, pp. 695–699*).—Previously reported studies on the chemical composition of cabbage (E. S. R., 54, p. 803) have been extended to determinations of the soluble calcium and phosphorus, the ratio of soluble to total calcium and phosphorus, and the variations of each with the type of soil and maturity of the plant. Most of the cabbage was grown in two types of soil—an upland sandy loam which had been cropped for many years and an alkaline marsh soil which had been drained and kept under cultivation for about 10 years. Samples were picked at various stages from young green to fully mature. From 50 to 60 heads were taken at each time of harvesting and the samples used for analysis taken from 100- to 125-lb. lots of the shredded material. For the soluble calcium and phosphorus the method of Tottingham, Schulz, and Lepkovsky (E. S. R., 51, p. 309) was used to obtain the extract.

The minimum, maximum, and average percentages of total calcium for the 12 samples of cabbage were 0.038, 0.053, and 0.046 per cent. The marsh samples contained approximately one-third more calcium than the upland samples. The soluble calcium averaged 60 per cent of the total calcium, the amount decreasing from the immature to the mature samples. Corresponding figures for total phosphorus in the same samples were 0.023, 0.036, and 0.028 per cent, respectively. The soluble phosphorus averaged 61 per cent of the total, and as in the case of calcium the amount decreased as the season advanced.

The average results for both calcium and phosphorus differed by less than 10 per cent from those reported in the previous paper for 18 samples grown in 1924.

The composition of crude cottonseed oil.—A summary, G. S. Jamieson and W. F. Baughman (*Jour. Oil and Fat Indus., 3 (1926), No. 10, pp. 347–355*).—A summary of data reported in the literature on the physical and chemical constants and chemical composition of crude cottonseed oil.

Physical chemistry of the cells and tissues, R. Höber (*Physikalische Chemie der Zelle und der Gewebe. Leipzig: Wilhelm Engelmann, 1926, 6. ed., rev., pp. XVI+955, figs. 125*).—The subject matter of this reference book is arranged in two parts, the first dealing with the physical chemistry of homogeneous and heterogeneous systems and the second with the physical chemistry of body juices, cells, and tissues.

A chemical study of cystine from kidney stones, R. A. GORTNER and W. F. HOFFMAN (*Soc. Expt. Biol. and Med. Proc., 23 (1926), No. 8, pp. 691–693*).—The results obtained in an examination of purified cystine isolated from kidney stones have been compared with data reported in the literature for protein cystine and other samples of stone cystine.

Some of the properties were identical with those previously reported for stone cystine, others for protein cystine, and still others were distinct from both. The possible explanation of these differences is that "cystine is an extremely labile compound and possibly occurs in more than one form, so that persons working with cystine are probably working with a mixture of substances, and that this mixture varies in composition depending at least upon (1) the source of the biological material from which the cystine is prepared, and (2) the method of preparation which is used for the isolation and purification of this amino acid."

The effect of molecular complexity on the end-products formed by Clostridium thermocellum, W. H. PETERSON, E. B. FRED, and E. A. MARTEN (*Jour. Biol. Chem. 70 (1926), No. 2, pp. 309–317*).—The fermentative powers of the thermophilic microorganism *C. thermocellum* (E. S. R., 55, p. 203) have been tested on various sugars and related compounds.

In the fermentation of the monosaccharides, lactic acid was the product formed in largest amounts from all but two, rhamnose and galactose. More than 75 per cent of the fructose was converted into lactic acid, while galactose yielded little or no lactic acid, behaving more like cellulose in its fermentation. The polysaccharides derived from two or more sugar molecules behaved more like galactose than like the other monosaccharides. Salicin and mannitol resembled the simple sugars. The type of fermentation is considered to be determined by the complexity of the molecule. An exception to this was malic acid, which was not attacked. The lactic acid consisted almost entirely of the dextro form. The volatile acid was almost entirely acetic acid and the alcohol chiefly ethyl.

The effect of dihydroxyacetone on insulin hypoglycemia, W. R. CAMPBELL and J. HEPBURN (*Jour. Biol. Chem., 68 (1926), No. 3, pp. 575–583, fig. 1*).—Clinical and experimental evidence is reported indicating that dihydroxyacetone is capable of curing insulin hypoglycemia. Since previous evidence has shown that no substance inconvertible into glucose, mannose, or maltose can cure insulin hypoglycemia, it is considered to have been proved that dihydroxyacetone is a precursor of glucose.

The relation between peroxidation and antirachitic vitamin, L. YODER (*Jour. Biol. Chem., 70 (1926), No. 2, pp. 297–307*).—This contribution from the Iowa Experiment Station consists of a report of a systematic examination for peroxidation of a large number of substances previously examined for antirachitic potency. The test employed for peroxidation was the starch and hydriodic acid reaction with peroxides. One gm. of the substance to be tested was shaken with a mixture of 0.5 cc. of a fresh 2 per cent solution of soluble starch, neutral or faintly acid in reaction, and 1 cc. of 2.5 per cent hydrogen iodide. Under these conditions a faint blue color appears after 1 or 2 minutes in highly peroxidized, and in 10 minutes in faintly peroxidized, oils.

With a few exceptions in each group there appeared to be a correlation between antirachitic potency and peroxidation in the untreated and in the irradiated samples, but no correlation in excessively irradiated samples. Fresh mineral oils, which do not acquire antirachitic properties on irradiation, responded positively to the peroxidation test for a short time after irradiation, but lost this property after a day, while irradiated olive oil and cottonseed oil retained it after 14 days.

The author is of the opinion that the capacity to peroxidize is a function of the antirachitic potency of a compound.

The action of light on cod-liver oil, P. R. PEACOCK (*Lancet* [*London*], *1926, II, No. 7, pp. 328–330, fig. 1*).—A study of the possible relation of loss of fluorescence in cod-liver oil on exposure to light to the content of vitamins A and D in the oil is reported.

The results indicate that there is no association between fluorescence and antirachitic value, but that loss of fluorescence and destruction of vitamin A parallel each other to a certain extent. That the phenomena are not identical, however, was demonstrated by the observation that the destruction of vitamin A is complete before the fluorescence has been entirely destroyed and, furthermore, that fluorescence is gradually restored on keeping the oil in the dark, while there is no corresponding recovery of vitamin A. The changes in fluorescence were found to be accompanied by changes in the absorption spectrum of the oil.

It is emphasized in closing that "light is a variable factor which must be taken into account in all quantitative experiments concerning the growth-promoting properties of cod-liver oil and the manner in which such oil is stored."

Further proof of the "bios" character of crytalline bios 223, R. W. KERR, W. H. EDDY, and R. R. WILLIAMS (*Soc. Expt. Biol. and Med. Proc., 23* (*1926*), *No. 6, pp. 416–419*).—Further proof that the activity of bios, isolated as previously described (E. S. R., 52, p. 110), resides in the pure crystals themselves is afforded by the demonstration that the activity of these crystals is lost by the formation of the crystalline benzene sulfonamide by the action of benzene sulfonchloride, and is restored by the hydrolysis of this inactive crystalline product. Since the reaction takes place at the NH_2 group, it is assumed that this group is concerned in the activity of bios.

Enzymes: Properties, distribution, methods, and applications, S. A. WAKSMAN and W. C. DAVISON (*Baltimore: Williams & Wilkins Co., 1926, pp. XII+364, figs. 10*).—In this monograph the extensive literature on enzymes, both of plant and animal origin, has been summarized under four main headings—properties of enzymes, distribution of enzymes, methods for the preparation and study of enzymes, and practical applications of enzyme activity. Especial attention has been paid to the occurrence and preparation of enzymes, to the methods of measurement, and to the practical application of enzymatic activity. A bibliography of over 1,300 titles is appended.

Allen's commercial organic analysis, edited by S. S. SADTLER, E. C. LATHROP, and C. A. MITCHELL (*Philadelphia: P. Blakiston's Son & Co., 1925, 5. ed., rewritten and rev., vol 4, pp. [4]+X+648, figs. 9*).—The corresponding edition of the first three volumes of this well-known reference book has been noted previously (E. S. R., 53, p. 503).

Adsorption from solution by ash-free adsorbent charcoals, I, II, E. J. MILLER (*Jour. Phys. Chem., 30* (*1926*), *Nos. 8, pp. 1031–1036; 9, pp. 1163–1169*).—Two papers are presented.

I. *A method for the purification of adsorbent charcoals.*—A method is described by which it is said to be possible to reduce the ash content of adsorbent charcoals of both animal and vegetable origin to a few hundredths or less of 1 per cent.

The method consists of a preliminary extraction with hydrofluoric acid either alone or in mixture with other suitable acids such as hydrochloric or sulfuric, followed by two extractions with concentrated hydrochloric acid, boiling with distilled water to remove the hydrochloric acid, drying, and

igniting at a temperature of from 900 to 1,200° C. in silica vessels from which the air is excluded. The process is repeated until the charcoal is of the desired purity, after which it is ignited to drive off adsorbed acid, boiled in conductivity water to which has been added approximately 1 cc. of N/50 sodium or potassium hydroxide per gram of charcoal, and finally boiled and filtered three or four times.

Data are reported on the ash content of samples of blood charcoal, norit, and activated sugar charcoal before and after several successive treatments with hydrochloric acid and of blood charcoal after successive treatments with a mixture of hydrochloric and hydrofluoric acids.

II. *Properties of purified adsorbent charcoals.*—The theory advanced in previous papers (E. S. R., 52, p. 110) that all charcoals would show the same behavior in adsorption from solution of acids, bases, and salts provided they could be freed from ash and adsorbed substances has been tested with charcoals of animal, vegetable, and carbohydrate origin purified by the method noted above, with results confirming this hypothesis.

All of the charcoals after purification had the same properties of selective adsorption from solutions of electrolytes, adsorbing acids but not inorganic hydroxides and adsorbing salts hydrolytically.

Methods are described for determining the activity and purity of adsorbent charcoals. The activity test consists in determining the adsorption capacity for benzoic acid. The presence or absence of adsorbed acids and alkaline inorganic matter is determined by two tests, based on the fact that inorganic acids adsorbed on charcoal may be quantitatively removed and estimated by treatment with alkali and that charcoal free from adsorbed acids has no effect on the strong inorganic bases.

The pH with quinhydrone electrode, L. E. DAWSON (*Sugar [New York], 28 (1926), Nos. 5, pp. 211–214; 6, pp. 262–264, fig. 1; 7, pp. 310–312, fig. 1; 8, pp. 369, 370*).—This paper consists of a comprehensive review of the literature on the theory, construction, and operation of the quinhydrone electrode, the advantages and limitations in its use, and its application to H-ion concentration determinations in sugar solutions. A bibliography of 103 titles is appended.

On the presence of amines in the distallate from Kjeldahl-Gunning nitrogen determinations.—Preliminary paper, R. A. GORTNER and W. F. HOFFMAN (*Jour. Biol. Chem., 70 (1926), No. 2, pp. 457–459*).—Data are presented showing that amines are present in the distillate from a normal Kjeldahl-Gunning digest to the extent of approximately 7 per cent of the nitrogen. The amount of amines is greatly increased by the presence of salts of the dibasic metals magnesium, calcium, strontium, and barium. In the presence of magnesium sulfate, nearly one-fifth of the total nitrogen in the distillate is in the form of amines.

A new factor for converting the percentage of nitrogen in wheat into that of protein, D. B. JONES (*Cereal Chem., 3 (1926), No. 3, pp. 194–198*).—"In the light of results recently obtained from a study of the proteins of wheat bran [E. S. R., 54, p. 309], a new factor for the conversion of the percentage of nitrogen in wheat into terms of protein has been calculated. The conversion factors for the nitrogen in the three parts of the kernel are bran 6.31, endosperm 5.70, embryo 5.80. By basing the calculation on the percentages of nitrogen in the individual proteins of the endosperm, embryo, and bran, and on the relative proportions in which these proteins are present, the conversion factor 5.83 is obtained for the nitrogen of the whole kernel, instead of 5.7, the factor generally used."

A rapid method for determination of the free and hydrolyzable sugar content of foodstuff, G. W. PUCHER (*Soc. Expt. Biol. and Med. Proc., 23 (1926),*

No. 6, pp. 470–472).—The method developed by Thomas and Dutcher for analyzing the free sugar content of plant material (E. S. R., 53, p. 108) has been adapted to the analysis of the free carbohydrates in foodstuffs. Data are given on the percentage of free and hydrolyzable sugars in various fruits and vegetables, cereal products, and diabetic preparations.

The sugar in urine and in blood, O. FOLIN and A. SVEDBERG (*Jour. Biol. Chem., 70 (1926), No. 2, pp. 405–426*).—This paper, which should be consulted in the original for descriptions of technique, consists of a revision of the recently described method of determining sugar in normal urine (E. S. R., 55, p. 613) necessitated by the source of error described by Benedict (E. S. R., 55, p. 805), specifications as to the conditions which must be observed in using the method for the determination of sugar in blood, a description of a fermentation method for the determination of sugar in blood said to be simple, convenient, and dependable, data on the nonglucose sugar of the blood under varying conditions, and a preliminary description of a class of alkaline copper reagents which are reduced by the ordinary nitrogenous products, having distinct reducing properties, but are unaffected by reducing sugars.

Fearon's "pyrogallol" test as a possible basis for the estimation of vitamin A, S. G. WILLIMOTT and T. MOORE (*Biochem. Jour., 20 (1926), No. 4, pp. 869–872*).—A critical examination of the Fearon pyrogallol test for vitamin A (E. S. R., 55, p. 712) leading to certain modifications in the test is reported.

The principal changes introduced were the use of resorcinol in place of pyrogallol and of benzoyl peroxide to hasten the color development. The absolute exclusion of water was found to be unnecessary when sufficient acid was present. Proper adjustment of the resorcinol concentration was found to be most essential, the transition from blue to red being most rapid at a concentration about 0.5 per cent that of the oil being tested. The quantitative technique finally adopted consisted in dropping various quantities of the oil into test tubes and adding to each an amount of an ethereal solution of resorcinol equivalent to 0.5 per cent of the oil, and then with thorough vertical shaking 5 cc. of 10 per cent trichloroacetic acid in toluene and 0.5 cc. of benzoyl peroxide in toluene. After about 2 hours the colors are compared against a solution of magenta toned with methylene blue. Data are reported showing that under these conditions the color developed is fairly proportional to the amount of oil taken.

In qualitative tests positive results were obtained with all cod-liver oils, beef suet, butterfat, and egg yolk fat, and negative with olive oil, linseed oil, palm kernel oil, and "ostelin" (a preparation rich in vitamin D).

The relation of storage to the quality of sweet potatoes for canning purposes, C. W. CULPEPPER and C. A. MAGOON (*Jour. Agr. Research [U. S.], 33 (1926), No. 7, pp. 627–643, figs. 4*).—The observation in a previous study (E. S. R., 47, p. 613) that if sweet potatoes are canned immediately after digging the product is firmer than if they are subjected to the usual curing treatment before canning has led to a comparison with a large number of varieties of sweet potatoes of the quality and composition of the product canned before and after the usual curing treatment and storage for a month. Uniform canning methods were used throughout for two types of product—whole potatoes in No. 3 cans and pulp or pie stock in No. 2 cans. The methods of analysis were the same as in the previous study, and the products were examined for quality by practical cooking tests.

With all of the 36 varieties and strains tested, the freshly dug potatoes yielded a firm product and the cured and stored stock a product varying all the way from a medium to a very soft consistency. The chemical changes

responsible for the differences in consistency were the transformation of starch to dextrin and sucrose and, during cooking, a splitting of a portion of the starch to maltose. The ratio of starch to moisture determined the consistency of the product. The varieties yielding the most attractive product in the can were Nancy Hall, Gold Skin, Vineless Pumpkin Yam, and Porto Rico.

In the cooking experiments the products from the freshly dug sweet potatoes gave better results in all cases than from the cured stock, particularly in the preparation of sautéd and candied sweet potatoes. Gold Skin was given first place in the cooking tests, with Vineless Pumpkin Yam and Porto Rico tying for second place.

"As a result of these combined studies it is apparent that by judicious handling of the raw stock the sweet potato canner is able to put on the market products suited to every demand which the sweet potato supplies as a table commodity, and which for certain culinary uses is equal if not superior to the fresh vegetable."

METEOROLOGY

Meteorology and agriculture (*Jour. Min. Agr.* [*Gt. Brit.*], *33* (*1926*), *Nos. 8, pp. 747–753; 9, pp. 814–824*).—Abstracts are given of eight papers presented at a conference on the effect of weather on crop growth, as follows:

The influence of summer rainfall on the fruiting of apples, A. H. Lees.—The following correlations between previous crop, previous rainfall, and succeeding crop of apples have been found to hold for adult trees provided that excessive frosts or continuous cold winds do not interfere in the spring:

Relation of previous crop and rainfall to succeeding crop

Previous crop	Previous rainfall	Succeeding crop	Previous crop	Previous rainfall	Succeeding crop
Heavy	Wet	Very poor.	Light	Wet	Medium.
Heavy	Medium	Poor.	Light	Medium	Good.
Heavy	Dry	Medium.	Light	Dry	Very good.
Medium	Wet	Poor.	None	Wet	Good.
Medium	Medium	Medium.	None	Medium	Very good.
Medium	Dry	Good.	None	Dry	Very good.

A rainfall under 6 in. during June, July, and August is classed as dry, 6 to 9 in. medium, and over 9 in. wet.

Meteorological conditions and the growth of barley, F. G. Gregory.—Pot experiments with pure lines of barley under controlled moisture with quantitative measures of plant growth showed that carbon assimilation is almost completely controlled by climatic factors, especially light intensity. Rate of leaf growth increases with increased day temperature and decreases with increased night temperature. The increase in dry weight, or the efficiency index, increases with higher day temperature and decreases with higher night temperature. In other words, increase in temperature accelerated leaf growth and carbon production, which determine yield. Bright sunshine showed an opposite effect on both processes.

Essentials of theory and points of practice in crop weather work, F. L. Engledow.—The difficulties encountered in a study of the effect of weather on crops are discussed.

Technique of crop observations, T. Eden.—The importance of getting as many measurements in the field as possible is emphasized, and the following are recommended as characters giving the best measure of performance of

oats: The capacity of the plant to tiller, the character of the leaf, and the total height of the plant.

Solar radiation, R. Corless.—Conditions which modify the intensity of solar radiation and methods of measuring it are discussed, attention being called particularly to the Callendar radiograph.

Solar radiation and plant growth, V. H. Blackman.—The relation of solar radiation to form of growth and carbon assimilation is briefly discussed. Studies of the effect of increasing the carbon dioxide content of the surrounding air are referred to. Emphasis is placed upon the importance of working with the crop as a whole and not with detached leaves. It is suggested that "differences of crop-yield of different varieties may be partly due to their different efficiencies in the utilization of solar radiation."

The value of coordination in phenological observations, J. E. Clark.—Progress in coordinating and establishing systematic observations in England, United States, Holland, Belgium, and Germany is reviewed, and attention is called to the plan of the Royal Meteorological Society for observations at 300 stations in England, as well as the work of 12 centers on the Continent. Confirmation of the general applicability of the bioclimatic law of Hopkins is noted.

The value of phenological observations in practical agriculture, A. Roebuck.—Periodicity in plant growth as determined by natural conditions and modified by culture is discussed, as is the general applicability of the bioclimatic law. Attention is called to the use of index plants to indicate the state of the season. It is stated that "oats sown when the purple plum (*Prunus pissardi*) commences to flower have yielded well and been free from frit fly attack, the pest most feared by growers. The flowering of the elder (*Sambucus nigra*) has also coincided with seeding of swedes to obtain good crops. The best time for seeding of winter oats appears to be between the flowering of ivy (*Hedera helix*) and the ripening of holly berries (*Ilex aquifolium*)." Reference is made to a plan proposed by the Ministry of Agriculture for testing the possibilities of this idea.

Climatological data for the United States by sections, [July–August, 1926] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 13 (1926), Nos. 7, pp. [195], pls. 3, figs. 3; 8, pp. [193], pls. 4, fig. 1*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for July and August, 1926.

Meteorological summaries for the year 1925 (*Kentucky Sta. Rpt. 1925, pt. 1, pp. 32–34*).—Data compiled from records of the United States Weather Bureau Station at Lexington, Ky., on temperature, precipitation, wind, and cloudiness are summarized in tables. The data for temperature and precipitation cover the years 1872–1925.

Meteorological report for the year 1925 (*Montana Sta. Rpt. 1925, pp. 50–52*).—Observations at Bozeman, Mont., on temperature, precipitation, evaporation, cloudiness, and wind are summarized. The mean temperature for the year was 43.5° F.; the highest 96°, July 14; the lowest −2°, January 28 and March 13. The total precipitation was 19.48 in. The first killing frost in autumn occurred October 1, the last in spring May 10. The number of clear days was 145. The evaporation for the months of April to October, inclusive, was 35.02 in. The mean temperature for the three months January to March, inclusive, was the highest ever recorded at this place, 30.9°, and the minimum for these months, −2°, was the highest ever recorded. September and October were unusually rainy, and this retarded harvesting and threshing grain.

Climatological summary for State College, Pennsylvania, 1925 (*Pennsylvania Sta. Bul. 204 (1926), p. 40*).—A summary is given of monthly and

annual temperature, precipitation, and cloudiness. The annual temperature was 49.6° F., 1.6° above the 41-year normal. The extremes of temperature were 95° June 5 and −14° January 28. The precipitation for the year was 33.95 in., 5.64 in. below the normal. The snowfall was 44.5 in. There were 127 clear days.

SOILS—FERTILIZERS

Electrodialysis of the colloidal soil material and the exchangeable bases, S. Mattson (*Jour. Agr. Research* [*U. S.*], *33* (*1926*), *No. 6, pp. 553–567, fig. 1*).—In studies conducted by the U. S. D. A. Bureau of Soils two soil colloids, representative of widely different groups of colloidal soil materials, were electrodialyzed in order to determine what part of the bases can be removed by this process.

Preliminary work showed that the quantity of bases that can be removed by electrodialysis is fairly definite, and that the order in which the different bases appear in the cathode chamber is about as follows: Calcium, potassium, sodium, magnesium, aluminum, manganese, and iron. It is pointed out, however, that this may not represent the order in which the cations are released from the colloid particles, since the appearance of the bases in the cathode chamber is largely affected by the H-ion concentration in the compartment containing the colloid.

The total quantity of bases removed by electrodialysis from one colloid was about five times that removed from the other. While the percentages of the calcium or sodium in the colloid that were removable did not agree closely in the case of the two colloids, it was evident that the various bases are characterized by different degrees of removability. The proportion of the total lime or manganese removable by electrodialysis was much greater than the proportion of magnesium, potassium, or sodium, and the proportion of total aluminum or iron removable was still less. Extraction of the two colloids with normal ammonium chloride or N/20 hydrochloric acid yielded quantities of the monovalent and divalent bases that were almost identical with those obtained by electrodialysis.

Treatment of the electrodialyzed colloids with a calcium chloride solution developed quantities of acidity that approximated the base exchange capacities of the untreated colloids. It appeared that in the process of electrodialysis there is a substitution of hydrogen ions from the water for most of the monovalent and divalent cations removed by the electric current. It was evident that each of the monovalent and divalent bases in the colloid is present in two conditions which might be defined simply as exchangeable and nonexchangeable.

It is pointed out that if the deductions involved in formulas connecting electrical migration with electrokinetic potential and charge of the particles are correct, only a part of the exchangeable bases in the colloid are present in the dissociated condition.

Ion exchange in relation to soil acidity, W. P. Kelley and S. M. Brown (*Soil Sci., 21* (*1926*), *No. 4, pp. 289–302*).—Studies conducted at the California Experiment Station are reported which showed that dilute acids react with soil in much the same manner as neutral salts, the reaction involving an exchange of ions. When reacted on by acids the exchange complex gives up base in exchange for H ions. The soil then becomes unsaturated with base and therefore acidic. H ions are energetic replacing ions. Weak acids, such as carbonic acid, are capable of effecting an exchange of H ions for soil bases. The H ions may in turn be displaced from the soil, in part at least, by the base of a neutral salt, with the resulting formation of an acid solution.

Dialysis experiments indicated that the exchange complex ionizes to some extent. The ionization products of a base-saturated soil are composed largely of the replaceable bases as cations and aluminosilicate particles as anions.

The replaceable bases of mineral soils are believed to be chemically combined as salts of one or more of the aluminosilicic acids, and when displaced by H ions the compounds become acid silicates. It is suggested that the electronegative character of soils, their cataphoretic property, etc., are due, in part at least, to the ionization of true chemical compounds rather than to the influence of adsorbed ions.

It was found that when a soil is treated with aluminum chloride a replacement of soil bases takes place. The H ion formed as a result of hydrolysis, and not the aluminum ion, is responsible for the replacement. It is considered probable that the trivalent bases which are removed from an acid soil by extraction with a neutral salt solution are probably brought into solution as a result of the solvent power of the solution, which is materially increased by the H ions that are displaced from the exchange complex by the neutral salt.

A considerable number of acid soils were found to contain subnormal amounts of replaceable calcium. It is considered probable that this condition will prove to be a general characteristic of acid soils.

Other results of the work are presented in detail.

Some comparisons of the properties of humid-tropical and humid-temperate American soils, with special reference to indicated relations between chemical composition and physical properties, H. H. BENNETT (*Soil Sci., 21 (1926), No. 5, pp. 349–375, figs. 4*).—Reconnaissance studies by the U. S. D. A. Bureau of Soils in humid Central America are reported in which two distinct classes of upland clay were found, with properties not explainable by their relative content of sands, silt, and clay. Soil with as much as 99.3 per cent of silt and clay, of which 71 per cent was colloids, were exceedingly friable, highly permeable, very resistant to erosion, and so lacking in stickiness as to plow to a crumbled condition immediately after heavy rains. Clay of the opposite group with as much as 97.4 per cent of silt and clay, of which 82 per cent was colloids, possessed extreme plasticity and stickiness and absorbed very little water. Those clays grouped on the basis of a molecular ratio of $\frac{SiO_2}{Al_2O_3+Fe_2O_3}$ = less than 2 were usually much more friable than those having a corresponding ratio greater than 2, and in parts of their profile those of the former group were more friable and permeable than most upland clays of the humid United States.

The evidence obtained points toward more advanced weathering in the material of the more friable soils, this giving an end product of relatively low contents of silica and of the bases CaO, MgO, Na_2O, and K_2O, and relatively high contents of iron and alumina. The unusual permeability and resistance to dispersion in water seemed to be due to a flocculation of the colloids of such strong character as to make it exceedingly difficult for water to separate the grains.

The data are taken to indicate that degree of weathering rather than type of weathering explains the differences between the two groups of soils. The constantly warm temperature of the Tropics probably accounts for the very much larger proportion of friable clay soils in humid tropical than in humid temperate zones.

On the composition of the fractions separated by mechanical analysis from some Transvaal soils, R. DE C. MARCHAND and C. R. VAN DER MERWE (*So. African Jour. Sci., 22 (1925), pp. 104–118*).—Data from chemical studies of

sandy soils, red clay soils and heavy red loams, and black clay soils are presented, together with information on weathering and on the physical properties and composition of clay.

Saline County soils, R. S. Smith, E. A. Norton, E. E. DeTurk, F. C. Bauer, and L. H. Smith (*Illinois Sta. Soil Rpt. 33 (1926), pp. 53, pl. 1, figs. 7*).—This survey deals with the soils of an area of 247,488 acres in southeastern Illinois which lies within the lower extremity of the glaciated region of the State. The county has extremes in topography which are due primarily to the rugged hilly character of the Ozark highlands. The area is generally well drained.

The soils are grouped as upland timber, terrace, swamp and bottomland, and residual soils. Eleven soil types are mapped, of which the yellow-gray and yellow silt loam upland timber soils and the deep gray silt loam swamp and bottomland soils cover 30.88, 23.68, and 18.15 per cent of the area, respectively. The results of analyses of the prevailing soil types are summarized, indicating that the phosphorus content of the soils of the county is low. The amounts of calcium are also rather low.

An appendix is included giving explanations for interpreting the soil survey and outlining the principles of soil fertility, together with a supplement of field data from five experimental fields.

Soil survey of Merrick County, Nebraska, F. A. Hayes et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+871–919, fig. 1, map 1*).—This survey, made in cooperation with the University of Nebraska, deals with the soils of an area of 304,640 acres in east-central Nebraska. The topography of the small upland area is for the most part rough and dissected, while the alluvial lands have a generally flat to gently undulating relief. The county is said to be as a whole well drained, although there are extensive areas throughout the bottom lands which are either subject to overflow or in which the water table often rises too near the surface.

The soils of the county are classed as loessial, alluvial, and aeolian soils. Including dunesand and riverwash, 26 soil types of 9 series are mapped, of which the Cass fine sandy loam covers 14.3 per cent of the area.

Soil temperature records during 1923 (*Egypt Min. Agr., Cotton Research Bd. Ann. Rpt., 4 (1923), pp. 107–119*).—Soil temperature studies of Egyptian soils are reported, the results of which are taken to indicate that the maintenance of the fertility of Egyptian soils is directly dependent upon the sharaqi period. The fact that the yield of cotton following a summer fallow is greater than that following no fallow or a short fallow is considered to be strong evidence that the decline in the yield of cotton is directly attributable to the elimination of the fallow period beyond the point necessary for the maintenance of soil fertility. A heavy dressing of Nile silt had no effect upon the cotton crop. This is taken to indicate that the decline in the yield of cotton can not be attributed to a reduction in the amount of Nile silt received by the land under perennial irrigation.

Drainage waters at Cawnpore, H. N. Batham (*India Dept. Agr. Mem., Chem. Ser., 8 (1926), No. 8, pp. 127–152, figs. 5*).—Data from 13 years' observations on the amount and composition of the rain and drainage waters of Cawnpore are reported (E. S. R., 27, p. 19).

It was found that the heavier the rainfall the greater is the drainage of any particular place. The difference in the quantities of water percolating through gauges of the same size always varies, but it generally remains below 2 in. The variations are greater in the case of 3-ft. gauges than in the case of 6-ft. Shallow gauges give greater quantities of drainage water than the deeper ones.

Cropping was found to reduce the drainage considerably, and the heavier the crop the less was the drainage and the greater was the evaporation. The maximum amount of drainage was found to take place during the months of August and September. Evaporation was found to decrease when the rainfall increased. The evaporation was usually greater from a cropped gauge than from a fallow one, and nearly always greater from a deep gauge than from a shallow one.

The content of nitrate in drainage waters appeared to decrease rapidly with time. The fallow gauges of different sizes gave nearly the same quantities of nitrogen in their drainage waters. This is taken to indicate, therefore, that the nitrate comes only from the surface soil. Fallow gauges were found to lose about seven times more nitrogen in their drainage waters than the cropped ones, and the maximum loss of nitrate in drainage took place during the month of August.

The loss of soluble salts in runoff water, F. L. DULEY (*Soil Sci., 21 (1926), No. 5, pp. 401–409*).—Studies conducted at the Missouri Experiment Station are reported in which the run-off water from the soil erosion plats at the station was sampled and analyzed for a period of one year.

The total amount of dry salts lost varied from 166.8 lbs. from the plat in wheat and clover to 380.1 lbs. per acre from the plat which was spaded 4 in. deep in the spring and fallowed throughout the season. Calcium and sulfur were lost in larger amounts than any of the other elements determined. The loss of potassium was relatively small, but amounted to considerably more than would ordinarily be applied in commercial fertilizer in several cases. The losses of magnesium, sodium, and phosphorus were too small to be of much practical importance.

The results indicated further that the surface run-off water is not a great source of nitrogen loss. The soluble salts from the fallow plats showed a higher percentage of inorganic material than did the soluble material coming from land carrying a crop.

The reclamation of land containing sodium chloride and sodium carbonate (*Egypt Min. Agr., Cotton Research Bd. Ann. Rpt., 4 (1923), pp. 120–128*).—Experiments are reported which indicated that the reclamation of land containing sodium chloride may be considerably hastened and rendered independent of the summer water supply by the use of sodium bisulfate, and that land containing sodium carbonate may also be reclaimed.

Soil treatment with various disinfectants, T. G. MAJOR (*Sci. Agr., 6 (1926), No. 8, pp. 283–285*).—The preliminary results of experiments in progress at the Central Experimental Farm, Ottawa, on a number of preparations for the disinfection of tobacco seed bed soils are reported.

Dust treatment of the soil was of no value. In the liquid treatments the formaldehyde preparations did not appear to injure the plants as much as did the mercuric compounds. Data taken on weed control showed that none of the preparations will check the development of weeds without also injuring the tobacco.

Some protozoa found in certain South African soils, V, H. B. FANTHAM and N. F. PATERSON (*So. African Jour. Sci., 22 (1925), pp. 355–399*).—In the fifth contribution to the subject from the University of Witwatersrand (E. S. R., 53, p. 618), data on protozoa from soils of the Cape Province, Natal, and the Transvaal are reported.

Frost seemed to cause a decrease in the number of protozoa. Veld burning was found to be injurious to protozoal cysts in some soils. Soils examined in cultures before and after the addition of fertilizer showed in some cases a

reduction in the number of species of protozoa, confirming the previous finding that certain protozoa are affected selectively by certain fertilizers.

A comparison of the protozoa from banana soils from two different districts showed that about half of the species observed were common to both soils, and that a greater number of the species occurred in the moister and more acid soils.

Effect of the summer fallow upon Egyptian soil protozoa (*Egypt Min. Agr., Cotton Research Bd. Ann. Rpt., 4 (1923), pp. 119, 120*).—Studies are briefly reported which indicated conclusively that cyst forms of protozoa are being dealt with in sharaqi soils, and that as the temperatures of these soils are not high enough to kill cyst forms the protozoa of sharaqi soils are not suppressed. This is taken to indicate, therefore, that Egyptian soils can exhibit the characteristics of partially sterilized soils without the protozoa being suppressed. An investigation of the effect of heat upon the physical properties of the soil has shown that heating results in a modification of the colloidal properties of the soil and its behavior toward water.

[Soil fertility studies by the Indiana Station at Moses Fell Annex Farm], H. J. Reed and E. W. Moore (*Indiana Sta. Circ. 135 (1926), pp. 2–7, fig. 1*).—The progress results of general soil fertility studies are briefly summarized.

[Soil fertility studies at the Pennsylvania Station] (*Pennsylvania Sta. Bul. 204 (1926), pp. 9–11*).—The progress results of work on the subject are briefly summarized.

Rebuilding soil cropped continuously to grain (*Montana Sta. Rpt. 1925, pp. 25, 26, fig. 1*).—Data are briefly reported indicating that a serious deficiency of the experimental soil is in available nitrogen, and that the nitrogen in alfalfa brings about greater soil improvement than does commercial fertilizer.

The use of oat straw in a system of soil fertility, R. P. Thomas and H. J. Harper (*Soil Sci., 21 (1926), No. 5, pp. 393–400*).—Studies conducted at the Iowa Experiment Station are reported in which the effects of applications of oat straw on the accumulation of nitrate in soils when applied alone and in combination with red clover, Hubam clover, sodium nitrate, and ammonium sulfate were studied under greenhouse conditions.

The results showed that the addition of oat straw did not appreciably affect the accumulation of nitrates in Webster silt loam and Carrington loam soils. Soil treated with straw alone yielded less than untreated soil. Where oat straw was applied and turned under with the second growth of red clover, Hubam clover, and alfalfa no retardation of nitrate occurred except in that portion of the soil immediately in contact with straw which was not mixed with the legume. Additions of oat straw alone and in combination with red clover and Hubam clover to Carrington loam had no retarding effect on the growth and yield of corn.

The conclusion is drawn that straw can be returned to many Corn Belt soils by spreading it on the second growth of red clover, on Hubam clover, or on biennial sweet clover, and by plowing in the fall wherever possible, without causing any injury to crop growth and yield.

Geometrical calculation of ternary fertilizer mixtures using triangular coordinates, B. Colbjörnsen (*Indus. and Engin. Chem., 18 (1926), No. 7, pp. 724–726, figs. 6*).—This method of calculation is outlined in some detail and compared with the algebraic method.

Nitrogen and cultivated plants [trans. title], O. Arrhenius (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 299 (1926), pp. 27, pl. 1, figs. 2; Eng. abs., pp. 24–26*).—Preliminary experiments are reported on the influence of the concentration of nitrate nitrogen in the development and

The results indicated that the three plants which did not assimilate nitrogen behaved in about the same manner. At the zero concentration they did not yield anything. The weight of the plants increased rapidly with increasing nitrate concentration. For sugar beets there was a decrease in yield from the 9 to 32 concentration. Clover behaved differently. It grew fairly well at the zero concentration, reaching a maximum at 3, decreased to 9, and then increased at 32. Nodule formation was strongly influenced by the nitrate concentration.

It was found that if the nitrate concentration is kept at the optimum for 6 weeks, it may then decrease considerably without any serious effect on the yield. After three weeks, however, the influence of a drop is quite marked. The results are taken to indicate that 9.5 mg. of nitrate nitrogen per kilogram of soil is the optimum concentration, and that this concentration need be kept only during the first stages of growth.

Maps showing the distribution of nitrates in the soils of two Swedish farms are given. Fallow soils contained a very high nitrate concentration. On the other hand, grass and corn soils contained no nitrates. The nitrate content was increased as soon as cultivation of the soil was begun.

The nitrogen compounds in rain and snow, F. T. Shutt (*Canada Expt Farms, Div. Chem. Rpt., 1925, pp. 68–74*).—A summary is presented of the data obtained during the past 17 years' observations of the amount and character of the nitrogen compounds in rain and snow. The progress of these observations has been previously noted (E. S. R., 54, p. 422).

The Chilean nitrate industry, B. D. Ossa (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 3 (1925), No. 4, pp. 942–971, pls. 13, figs. 18*).—A profusely illustrated description of the Chilean nitrate industry is presented in a contribution from the University of Chile.

Nitrifying power of pozzuolana [trans. title], C. Serono and L. Guerci (*Ann. Chim. Appl. [Rome], 15 (1925), No. 7, pp. 309–316*).—Studies on the manner of formation of nitrates occurring in volcanic soils showed that the transformation into nitrate of ammonia, probably of volcanic origin, is due to the catalytic action of the pozzuolana in the presence of moisture and atmospheric oxygen. This does not appear to be a superficial action, but one characteristic of pozzuolana which takes place at a temperature not exceeding 100° C. (212° F.).

Phosphoric-acid content of crops grown upon peat soils as an index of the fertilization received or required, F. J. Alway, W. M. Shaw, and W. J. Methley (*Jour. Agr. Research [U. S.], 33 (1926), No. 8, pp. 701–740, figs. 8*).—Studies conducted at the Minnesota Experiment Station are reported of the ash and phosphoric acid contents of crops from fertilized and unfertilized peat soils and of hay from black prairie soils.

The phosphoric acid contents of hays, straws, and even grains grown on peat soils deficient in phosphate were greatly increased by phosphate fertilization, except where the application was very light, and greatly increased yields resulted. With the straws the increase in some cases amounted to several hundred per cent, with the hays from 20 to 50 per cent and even higher, and ---ith the grains usually between 10 and 60 per cent. The results are taken to 618], -ate that the phosphoric acid determination has the most significance when al are reisons are made between fields or plats of a crop in the same locality and Frost seeme season and with hay crops of the same cutting, using the sepaas found to urtant plants rather than mixed samples.

dtures before als of crops is said to be very useful in detecting mistakes in the fertilizers. It is considered difficult, however, to place either

upper or lower limiting values for the phosphoric acid requirement of any crop. Crop analysis is not considered a practical method of detecting phosphate deficiencies in black prairie soils.

The literature on the palatability and nutritive value of tame hay from peat lands is reviewed, and the possible bearing of the phosphoric acid content upon these properties is discussed. It is pointed out that certain minimum contents of phosphoric acid in hay may be secured, if desired, by heavy initial phosphate applications.

The relative availability of phosphatic fertilisers on acid and non-acid soils, G. Ingham (*So. African Jour. Sci., 22 (1925), pp. 122–134*).—Studies are reported which indicated that the availability of a phosphatic fertilizer in a soil depends more upon the nature of the soil than upon the water or citrate solubility of the fertilizer. The availability of superphosphate in 28 soils varied from 21 per cent of the total phosphoric acid for very acid soil to 96 per cent for a soil free from acidity. The availability of air-floated Egyptian rock phosphate was generally very little less than that of superphosphate except in the case of soils containing 0.5 per cent or more of calcium carbonate. In these cases the availability of rock phosphate was considerably less.

Little difference was found between the availability of superphosphate and of other forms of phosphatic fertilizers when equal amounts of phosphoric acid were applied to the soil. The availability was found to be closely related to the iron and aluminum contents, the amount of organic matter present, and the reaction of the soil.

Phosphates of iron and aluminum obtained by precipitation when an extract of superphosphate was added to soluble iron and aluminum salts were readily soluble in 1 per cent citric acid. It is suggested that low availability of a phosphatic fertilizer is due to the absorptive power of the organic and inorganic colloids. Acid soils were found to have a high absorptive capacity for phosphoric acid as well as for lime. Flocculation of the inorganic soil colloids is suggested as a means of reducing their excessive absorptive capacity.

It was found that the absorptive capacity for phosphoric acid of soil containing a large amount of iron and aluminum was doubled and the citrate solubility of the fertilizer was reduced to half by removing the calcium carbonate. The addition of calcium carbonate to an acid soil had no perceptible effect on the availability of superphosphate after a month, but gave a definite increase after 12 months.

The physiological value of phosphoric acid in superphosphate and other phosphates, J. Stoklasa (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 3 (1925), No. 4, pp. 921–941*).—Experiments carried on over a number of years at the State Experiment Station for Plant Production of Czechoslovakia on manuring with the different forms of phosphoric acid are reported.

The form in which water-soluble phosphoric acid appears in superphosphate was found to be important. Free phosphoric acid had a decidedly better effect than monocalcium phosphate when used on sandy loam and chalk soils. On the other hand, the water-soluble form of the acid stood the test better on humus soil. This is taken to indicate that fertilizer factories should manufacture a superphosphate for use on sandy loam and chalk soils in which the phosphoric acid is chiefly available in free form. It was found that the phosphoric acid insoluble in water in any form of the different types of phosphates now on the market has less physiological value than the water-soluble forms in superphosphate.

Effect of dressings of basic slag on the lime status of soils, R. Williams (*Jour. Agr. Sci. [England], 16 (1926), No. 2, pp. 196–204*).—Studies conducted

at the University College of North Wales are reported which showed that the addition of basic slag to moist base-unsaturated soils under laboratory conditions caused an increase in their content of exchangeable calcium, degree of saturation, pH, and amount of calcium soluble in an aqueous solution of carbon dioxide.

Slag seemed to be almost as effective as calcium carbonate or lime in increasing the exchangeable calcium and the degree of saturation of soils, but its action on pH was not so marked. The effect of dressings of slag on the lime status of soils from experimental plats was still evident after eight years. The exchangeable calcium of samples of soil taken from the same fields after an interval of six years showed a considerable decrease due to leaching.

It is suggested that the addition of low grade basic slag to unsaturated soils may tend to maintain or improve their lime status and will to some extent compensate for the losses of calcium due to drainage and crops.

Greensand as a source of potassium for green plants, J. R. Skeen (*Amer. Jour. Bot., 12 (1925), No. 10, pp. 607–616, figs. 4*).—This experimentation is said to be a continuation of that reported by True and Geise (E. S. R., 40, p. 423).

It is held that greensands offer a physiologically available source of potassium for plant growth. The percentage of potassium used for plant growth depends upon the quantity of greensand added, such percentage increasing in a sharply linear curve probably to 2 per cent and falling away sharply upon further addition of more greensand. No loss of potassium results from the addition of large amounts of greensand, but plants apparently absorb up to a definite maximum, the unabsorbed portion remaining as a reserve in the soil. It is claimed that the average soil deficient in potassium should show marked improvement for several years after the addition of from 5 to 15 tons of greensand per acre. It is thought best to have considerable calcium present in the soil or composted with the greensand.

Gypsum or copi, P. R. Scott and W. C. Robertson (*Jour. Dept. Agr. Victoria, 24 (1926), No. 2, pp. 65–74, figs. 9*).—Information on the mining and use of gypsum in Victoria is presented, together with data from experiments on the effect of gypsum on soil. It was found to liberate potash from minerals containing potash and, to a lesser extent, phosphoric acid, magnesia, and silica. It also encouraged the growth of legumes, increased the rate of ammonification, and flocculated the finer particles in soils.

The effect of sulfur on the microflora of the soil, J. M. Fife (*Soil Sci., 21 (1926), No. 4, pp. 245–252, figs. 5*).—Studies conducted at the Utah Experiment Station are reported on the influence of varying amounts of sulfur on the soil microflora as measured by numbers, ammonification, nitrification, nitrogen fixation, and the rate of sulfur oxidation. Three soils were used which were composed primarily of coarse and medium silt and fine sand.

Depending upon the soil and upon the amount of sulfur applied, the results showed that the addition of sulfur to soil increased the ammonifying power from 50 to over 100 per cent, and the nitrification over 100 per cent in some instances. Sulfur was without effect on nitrogen fixation in soil during the short period of the observations. The bacterial counts decreased as the incubation period increased. Relative to the untreated soil the bacterial numbers increased as the amount of sulfur increased in the soil containing a large amount of organic matter, whereas the bacterial numbers of soils deficient in organic matter decreased as the sulfur increased. From 36 to 89 per cent of the sulfur was oxidized to sulfates in 30 days, depending on the soil and its porosity.

Effect of sulphur on alfalfa and clover (*Montana Sta. Rpt. 1925, pp. 24, 25, fig. 1*).—Data are briefly reported which show that sulfur gave an average increase of 1.92 tons of alfalfa per acre and gypsum an increase of 1.35 tons per acre. The increase of protein in the crop was also quite marked.

AGRICULTURAL BOTANY

Plants and man, F. O. Bower (*London: Macmillan & Co., 1925, pp. XII+365, pl. 1, figs. 148*).—"The present aim is to explain for the general reader, in very general terms, how plants fabricate for their own life commodities that man finds so useful in his. . . . A number of the later chapters are devoted to the conjoint life, so common among plants, which is promoted by crowding and close contact . . . all the varied grades of mechanical dependence, mutualism, parasitism, disease, death, and decay. These subjects have been broadly treated, rather from the point of view of plant-biology than from any other."

Studies of the rate of growth of leaves by a photographic method.—I, The determinants of the rate of growth of first leaves of Phaseolus vulgaris, M. C. Vyvyan (*Ann. Bot.* [*London*], *38* (*1924*), *No. 149, pp. 59–103, figs. 14*).—A photographic method is described for recording daily area increments in a leaf during growth, the sources of error not exceeding 1 per cent. An account is given of two experiments applying this in a series to be further reported. Results and their interpretation are detailed in comparative form.

"The form of the curve of percentage increments in area is shown to be approximately of a descending logarithmic type, but it is pointed out that as in its earlier portion this curve can be shown to be of a compound nature, the apparently logarithmic form, in this portion at any rate, is probably of little significance."

Contributions to an investigation of the chemical nature of the cellulose membrane, F. M. Wood (*Ann. Bot.* [*London*], *38* (*1924*), *No. 150, pp. 273–298*).—The state of the cellulose, either naturally or artificially produced, was studied with a view to determining whether oxidation or hydration had occurred. The optimum conditions for distinguishing between cellulose and pectin after the use of a double stain are those causing minimum oxidation and maximum hydration without disintegration. Particulars are given.

The viability of the nodule bacteria of legumes outside of the plant, I–V, M. M. Alicante (*Soil Sci., 21* (*1926*), *Nos. 1, pp. 27–52; 2, pp. 93–110, pls. 4*).—In experimentation treating inoculated seeds with soil, glue, and sugar, alone or in combination, some legumes remained viable, nodule production occurring after storage during 60 days in small seed bags under ordinary conditions. Sugar gave uniformly large, evenly distributed nodules. Soil with sugar gave no better results than did sugar alone.

Soils containing 10 per cent sugar developed acidity unfavorable to *Bacillus radicicola*. Cloth seed bags are better than glass containers for storing purposes.

B. radiobacter and *Azotobacter chroococcum* showed no unfavorable effects upon the life and infecting capability of nodule bacteria. Soy bean, sweet clover, cowpea, and garden pea bacteria, when grown together, showed no harmful effect upon each other. The activity of pea bacteria when grown in milk was not impaired by the presence of any one of the organisms tested, including *B. prodigiosus*, *B. capsulatus*, *B. subtilis*, *B. mesentericus*, pink yeast, and molds.

The multiplication rate was greater in high dilution than in low dilution. *B. radicicola* of garden pea lived in solution 142 days. Oxygen was a limiting factor during the whole growth of nodule bacteria in solution. Shaking gave increased growth. Calcium carbonate stimulated growth better than did tricalcium phosphate. The heat resistance of *B. radicicola* of garden pea and sweet clover and of *Pseudomonas radicicola* of cowpea and soy bean was lower than the heat resistance of *B. radiobacter* and *A. chroococcum*.

Peat maintained the life of nodule bacteria at a much higher temperature than brown silt loam. Acid soil lowered the thermal death point of legume organisms, and the organisms died in such soil after a short period of storage. The addition of calcium carbonate raised the thermal death point and the keeping quality of legume organisms. Abnormal media favored changes in the forms of nodule bacteria. The absence of phosphate or carbonate in the media resulted in the formation of bacteroids. Aluminum chloride and hydrochloric acid had similar effects on the form of legume bacteria. The presence of acetic, nitric, and sulfuric acids in media changed the legume bacteria into bacteroids, and each of these acids affected the form of the organisms specifically.

Lack of nodule-formation in a subfamily of the Leguminosae, L. T. LEONARD (*Soil Sci., 20 (1925), No. 2, pp. 165–167*).—In the subfamily Mimosaceae, examinations were made for root nodules in 24 species of the genus Acacia and the closely related genera Albizzia and Prosopis. *Acacia baileyana* alone failed to show root nodules. This exception is discussed.

A further contribution to the morphology and physiology of the genus Eidamia, A. S. HORNE and G. H. JONES (*Ann. Bot.* [*London*], *38 (1924), No. 150, pp. 351–359, figs. 4*).—In a previous investigation, apparently one that has already been reported and noted (E. S. R., 52, p. 215), Jones isolated a fungus which on further study appeared to be a new species of Eidamia and which has been described as *E. tuberculata*. The identity of *Monopodium uredopsis* and *E. acremonioides* is regarded as established.

A description of Colletotrichum biologicum nov. sp., and observations on the occurrence of a saltation in the species, H. CHAUDHURI (*Ann. Bot.* [*London*], *38 (1924), No. 152, pp. 735–744, pl. 1, figs. 7*).—A description is given of *C. biologicum* n. sp., as collected in Dahlem, near Berlin, October, 1921, from dying stalks of potatoes, with an account and summary of studies of the cultural characteristics of the fungus as developed on different media and under various conditions. The production of different colors by the saltant has been found to be entirely dependent on temperature.

Growth-inhibiting and growth-stimulating substances, W. F. GERICKE (*Bot. Gaz., 78 (1924), No. 4, pp. 440–445*).—"When pots containing fertile soils are seeded to wheat or barley for continuous seasons, and successive short-period crops of four to six weeks' growth are removed from such soils, it is found that the first crop is usually the largest, the immediately succeeding crops are much smaller, but some of the latter crops may be larger than some of the preceding ones. Thus instead of soils becoming progressively poorer by continuous cropping due to progressive diminution of its supply of plant food, they may become better at certain times than they were before, through certain processes and agencies concerned in the growth of plants." The results obtained with soils led the author to conduct experiments with culture solutions and to employ a method that would provide a number of successively grown crops under the same climatic complex. The results of this work are tabulated with discussion.

"The growth of plants is not only a complex of many processes, but is in a sense the result of the succession of processes. Some of these processes are de-

pendent on certain salts which supply necessary inorganic elements to plants." Experimental data show that a constantly maintained supply of nutrients in culture media is not as favorable to the growth (entire life cycle) of cereal plants as is a changing supply. This may indicate that any subsequent stage of growth may be beneficially affected by secretions from previous growth phases. Plants may thus be similar to animals in that they have a physiology which is subject to growth inhibiting, growth stimulating, and sensitizing agencies produced by the organism itself.

Effect of methyl and ethyl alcohol on the growth of barley plants, A. N. PURI (*Ann. Bot.* [*London*], *38* (*1924*), *No. 152, pp. 745–752, figs. 3*).—Ethyl alcohol is more toxic to barley plants than is methyl alcohol, the difference in the toxicity of the two being of kind as well as of degree. Ethyl alcohol favors the growth of ear shoots and the suppression of vegetative leaves, methyl alcohol favoring the growth of leaves and not that of the ear shoots. Plants in the later stages of growth can withstand the toxic action of ethyl alcohol much better than in the earlier stages.

The influence on vegetation of some cyanogen compounds [trans. title], A. PETIT (*Jour. Agr. Pract., n. ser., 45* (*1926*), *No. 25, pp. 490, 491*).—Experimentation is outlined in which small proportions of cyanogen compounds (potassium cyanide, potassium ferrocyanide, potassium ferricyanide, potassium cyanate, and potassium sulfocyanide) were furnished to certain plants in pots, which in most cases showed increase in weight over the controls.

The effect of general anaesthetics on the respiration of cereals.—I, Carbon dioxide production, E. P. SMITH (*Ann. Bot.* [*London*], *38* (*1924*), *No. 150, pp. 261–272, figs. 9*).—The effects of chloroform, ether, and ethyl alcohol concentrations on the carbon dioxide output of wheat, rice, and oats were found to be similar. With chloroform, recovery (defined as return to a completely responsive state) occurs only after very short exposure, whether continuous or intermittent. With ether, recovery occurs after exposure for six hours, if respiration is not allowed to fall below 60 per cent. The difference in toxicity is supposed to result from the formation of a more stable combination with some cell constituent by chloroform than by ether. Experiments with Ipomoea indicate that the effect of the anesthetic upon the permeability of the plasma membrane to carbon dioxide must be taken into account in the interpretation of these results.

The antagonism between dyes and inorganic salts in their absorption by storage tissue, C. E. T. MANN (*Ann. Bot.* [*London*], *38* (*1924*), *No. 152, pp. 753–777, figs. 8*).—The absorption of methylene blue, of neutral red, and of orange G, respectively, has been followed in simple solution and in solutions containing chlorides of ammonium, magnesium, aluminum, and lanthanum, and the results are detailed.

The colloid precipitation theory of the plasma membrane receives support from the phenomena of antagonism investigated and affords a possible explanation of the relationship existing between the degree of antagonism and the valency of the cation of the antagonizing salt. The results here reported are thought to be not inconsistent with the view that the plasma membrane carries an electrical charge.

Effect of light on growth of excised root tips under sterile conditions, W. J. ROBBINS and W. E. MANEVAL (*Bot. Gaz., 78* (*1924*), *No. 4, pp. 424–432, figs. 2*).—Continuing experimentation on growth of excised cornroot tips under sterile conditions (E. S. R., 53, p. 123), diffuse light was found to be favorable to the continued growth of root tips in a modified Pfeffer solution containing 2 per cent glucose, or the same solution to which 80 parts per million or 400

parts per million of autolized yeast were added. Anthocyan developed in some of the excised corn roots in the light, but in none in the dark. It was present in the rootcap, at points where secondary roots were to emerge or had emerged, and at the base of the root, but not in the meristematic region. The longest period during which a root tip was grown was 149 days, through 10 periods of transfer, in diffuse light in the modified Pfeffer solution containing 2 per cent of glucose and 400 parts per million of autolized yeast. "Roots which remained attached to the grain during the first two weeks grew for a longer time than those grown under excised conditions from the start. One such root was grown in the dark for 133 days, 119 in excised condition."

Further experiments on the conduction of tropic excitation, R. Snow (*Ann. Bot. [London], 38 (1924), No. 149, pp. 163–174, figs. 6*).—The author has shown previously (E. S. R., 52, p. 217) that the tip of a decapitated root, if stuck in place with gelatin, becomes again capable of curving down in response to gravity, though it could not then be certainly known that the effective excitation was transmitted past the gelatin, since the stimulus of gravity can not be applied to the tip alone. It was therefore decided to make tests with traumatic stimulus, and to compare quantitatively the effects of excitations on the convex and on the concave side of the root. Also other experiments, for which the root is not suitable, have been carried on with cotyledons of Avena.

It is claimed that the traumatic excitation can pass through the gelatin layer and produce a negative curvature in the stump. Tropic excitation due to traumatic stimulus or gravity stimulus can be conducted back along either side of the root alone. In Avena cotyledons, if the tip is removed and replaced in an anomalous position so that its far side (with reference to the light) is in connection with the near side of the stump, then, on illumination of the tip alone, phototropic curvature away from the light follows. Simply relative expansion is here regarded as causal. The excitation conducted down the far side of the Avena cotyledon can cross a gap filled with moisture.

Water content, a factor in photosynthesis, R. H. Dastur (*Ann. Bot. [London], 38 (1924), No. 152, pp. 779–788, fig. 1*).—It is concluded from this investigation that photosynthesis is dependent upon water content, and that under normal conditions it is inadequate water supply which terminates photosynthetic activity of leaves and ultimately causes their decay.

Evaporation in wind, W. Stiles (*Ann. Bot. [London], 38 (1924), No. 150, pp. 299–304*).—A critical examination is made of the contribution on the physics of transpiration by Sierp and Noack previously noted (E. S. R., 49, p. 127).

GENETICS

"Pluripotenz" phenomena: Synthetic contributions to the science of heredity and descent, V. Haecker (*Pluripotenzerscheinungen. Synthetische Beiträge zur Vererbungs- und Abstammungslehre. Jena: Gustav Fischer, 1925, pp. 213, figs. 26*).—There are assembled in this book a large number of obscure phenomena related to variation which deal especially with the physiological and environmental influences. The term "pluripotenz" is taken to include the numerous possibilities for development possessed by organisms which are not externally evident.

A portion of the work deals with an attack on the linear arrangement of genes in the chromosome and other linkage relations.

The standard errors of chromosome distances and coincidence, H. J. Muller and J. M. Jacobs-Muller (*Genetics, 10 (1925), No. 6, pp. 509–524*).—Theoretical formulas have been calculated for determining standard errors of

chromosome distances and coincidence. The latter is defined as the ratio of the proportion of double crossovers which actually occur in two regions to the proportion of double crossovers which would occur there if crossings over in the two regions were independent of each other. The application of the formulas is discussed, and it is pointed out that the standard error of coincidence is not finally determinate but may be approached within narrow limits.

A formula is also given for calculating the maximum and minimum possible true values of a proportion of crossovers which might occur in a random sample.

The chromosome numbers of the principal cereals, with general consideration of plant chromosomes and their number and size, K. V. Stolze (*Die Chromosomenzahlen der Hauptsächlichsten Getreidearten nebst Allgemeinen Betrachtungen über Chromosomen, Chromosomenzahl und Chromosomengrösse im Pflanzenreich. Leipzig: Borntraeger Bros., 1925, pp. [1]+71, figs. 54*).—Cytological studies concerned with the chromosomes in Secale, Triticum, Hordeum, and Avena are reviewed, with a résumé of research by the author in these genera. Significant findings in important studies on chromosome number and size in other plants are pointed out. More than 150 titles are listed in the bibliography.

Pollen abortion in chromosomal types of Datura, A. F. Blakeslee and J. L. Cartledge (*Natl. Acad. Sci. Proc., 12 (1926), No. 5, pp. 315–323*).—The present paper presents the results of a study of the proportion of abortive grains in the pollen of different chromosomal types of Datura.

The meiotic phase in certain mammals, C. E. Walker (*Roy. Soc. [London], Proc., Ser. B, 99 (1926), No. B 698, pp. 366–374, pls. 3*).—From studies of meiosis in material from guinea pigs, rats, mice, rabbits, and a monkey at the University of Liverpool, the author discusses the meiotic phase in these animals as follows:

"The daughter chromosomes elongate and divide longitudinally, filling the nucleus with irregularly distributed semivalent threads. During this process of unraveling of the chromosomes into semivalent threads an appearance very similar to that seen during synapsis is evident. These threads rejoin laterally in pairs, forming univalent filaments. These filaments join laterally in pairs. They again separate, excepting at their ends which remain joined until the first meiotic division takes place. The longitudinal split of the filament into semivalent threads reappears at the telophase, and is consummated at the second meiotic division."

The development of the ovum of the white mouse, Z. Frankenberger (*Biol. Gen., 2 (1926), No. 1–2, pp. 21–62, pls. 3, figs. 4*).—The results of a study of oogenesis in the white mouse are reported, based on sections of ovaries taken from mice varying in age from fetuses 12 mm. in length to full-grown individuals. The different stages in the growth and divisions are described and illustrated. The diploid chromosome number appeared to be 24, but the presence of various nucleoli is also noted in the formation of the mature ova.

The genus Epilobium [trans. title], E. Lehmann (In *Bibliographia Genetica. The Hague: Martinus Nijhoff, 1925, vol. 1, pp. 363–418*).—The systematic, morphological, and anatomical bases for employing plants pertaining to Epilobium in genetic research is discussed, with extensive comment on hybrids in Epilobium and on significant results in inheritance studies in the genus. The bibliography includes 177 titles.

Genetic investigations with mosses [trans. title], F. von Wettstein (In *Bibliographia Genetica. The Hague: Martinus Nijhoff, 1925, vol. 1, pp. 1–38*).—Genetic studies on Musci and Hepaticae are reviewed under the topics of de-

velopmental history, genetic investigations, hybridization experiments, and sexuality of mosses, and a bibliography of 128 titles is appended.

Present-day problems of corn breeding, H. K. HAYES (*Jour. Amer. Soc. Agron., 18 (1926), No. 4, pp. 344–363*).—Experimental results indicating the value of present methods of corn breeding are reviewed. Some questions of a research nature which remain to be solved are discussed.

Bud mutation in potato and its agricultural significance [trans. title], J. C. DORST (*Genetica [The Hague], 6 (1924), No. 1, pp. 1–123, pl. 1, figs. 20; Eng. abs., pp. 114–118*).—The author during 7 years collected bud mutations numbering 21 for the variety Eigenheimer, 12 for Red Star, 5 for Bravo, and 15 for all other varieties collectively. In case of several bud mutants reversion was found. As regards degeneration, further investigation is regarded as desirable. No good reason appears for the believing that bud mutation is limited to a few characters only. Deterioration of a given variety is considered as entirely possible without the agency of degenerative diseases. The action of a bud mutation may cause a variety to undergo a gradual change.

Bud sports in sweet potatoes, L. L. HARTER (*Jour. Agr. Research [U. S.], 33 (1926), No. 6, pp. 523–525, pl. 1, fig. 1*).—Three yellow and three red roots were found on a plant of the Haiti sweet potato, normally a red variety marked with small oval or elongated whitish to yellow spots. Two generations from each strain bred true as to color, but the progenies were similar in size and shape of roots, growth habits, and leaves.

Heritability of different rates of shedding in cotton, T. H. KEARNEY and R. H. PEEBLES (*Jour. Agr. Research [U. S.], 33 (1926), No. 7, pp. 651–661, fig. 1*).—An interspecific cotton hybrid, Pima Egyptian × Acala, was studied to ascertain whether genetic factors are involved in the shedding of the flower buds and the young bolls (abscission before and after anthesis). Practically no difference was observed in the mean percentage of bud shedding, whereas boll shedding was at a much higher rate in Acala than in Pima.

In both the F_1 and F_2 generations the hybrid gave much lower mean percentages of bud shedding than either parental population, while the mean percentage of boll shedding by both hybrid generations was between the parental types. The mean shedding percentage both of buds and bolls was about twice as great in F_2 as in F_1, and the differences were very significant. Eliminating the soil variation did not void this difference. While the frequency distributions of the F_1 population for percentage of bud shedding and percentage of boll shedding gave no indication of segregation in definite ratios, the behavior may be interpreted on the theory that three or more genetic factors are involved. The much greater variation in F_2 than in F_1 suggested that Mendelian segregation occurred. Further evidence of genetic factors in shedding was shown by the significant differences obtained by comparing the shedding percentages of pairs of adjacent F_2 plants, which practically eliminated the influence of soil heterogeneity, and also by the great disparity between the sizes of observed and expected standard deviations of the hybrid. This investigation is held to have supplied evidence that there are genetic factors for shedding which segregate and recombine in the usual manner.

Inheritance of white plumage in pigeons, J. R. WALKER (*Genetics, 10 (1925), No. 6, pp. 593–604*).—The results of various crosses in pigeons are reported which have been concerned with the behavior of four genetic factors related to white plumage. A factor, dominant white, in the homozygous condition produces practically self-white birds, and in the heterozygous nearly white birds. In the latter case part of the individual feathers are white and part are colored. A factor for recessive white spotting shows considerable

range in its expression, varying from no white to self-white. The individual feathers, however, are wholly white or wholly colored. In the heterozygous condition some feathers show white and coloring. This factor is also associated with dark brown irises in the homozygous condition. Mottle white is a recessive factor, producing a varying amount of white on and under the wings and on the rump after the first molt. It is apparent only in recessive-red birds. Mottle black, a dominant factor, behaves similar to mottle white except that it is apparent from birth. Genetically black birds never show mottle white, but mottle black appears in both blacks and reds.

The inheritance of hair color in Dachshunds, including observations on the inheritance of hair form [trans. title], J. Anker (*K. Danske Vidensk. Selsk., Biol. Meddel., 4 (1925), No. 6, pp. 72*).—From studies mainly of Danish Dachshund breeding records of individuals and societies the author found that in short-haired dogs the colors were explained by four dominant factors: *A* (black), *B* (red), *C* (tigering), and *D* (black cross stripes on red animals). Both *B* and *C* are epistatic to *A*. The theoretical proportions of the different types expected from the various crosses were tabulated and found to agree closely with the observed results.

In addition to *A* and *B* a gene *G* causes gray color in rough-haired Dachshunds. *G* is epistatic to *A* and *B*. In long-haired dogs a gene *E* for the extension of color is present, which in the recessive condition causes red.

The hair forms, short, long, and rough, are due to the action of two genes, *R* and *K*. The presence of *R* causes rough hair. *K* without *R* produces short hair, and when both factors are recessive the individuals are long haired The factors *K* and *E* appear to be linked.

On the occurrence in the house mouse of a Mendelizing structural defect of the retina producing blindness, C. E. Keeler (*Natl. Acad. Sci. Proc., 12 (1926), No. 4, pp. 255–258, fig. 1*).—The results of further studies of the hereditary retinal abnormality in mice (E. S. R., 55, p. 821) are reported. It has been established that the external nuclear layer is not entirely absent, though the rods and external molecular layer are absent. This condition results in total blindness. It is due to a recessive character which does not appear to be linked with sex, albinism, dilution, brown, pink-eye, recessive spotting, agouti, short ears, kinky tail, waltzing, or dominant spotting. It has no lethal action and can not be determined until about 13 days after the birth of the animal.

A study of hernia in swine, B. L. Warwick (*Wisconsin Sta. Research Bul. 69 (1926), pp. 27, figs. 7*).—The anatomy of the inguinal region of the pig is reviewed, including descriptions of the changes from the normal associated with inguinal and umbilical hernias.

The physical causes of inguinal hernias appeared to be large vaginal rings and a low degree of tensity of the tunica vaginalis. The importance of inguinal hernias was estimated from data obtained from various sources. In experiment station herds from which records were obtained inguinal hernia affected 1.68 per cent and umbilical hernia 0.60 per cent of the male pigs born, while 1.16 per cent of the females were herniated, practically all of which were umbilical. Inguinal hernias may appear at any time during the first month of age, but were found to occur more frequently on the left than on the right side.

Three generations of pigs were produced from mating a bilaterally herniated boar to females related to herniated boars. Of the first generation boars produced 14.28 per cent had hernias. The F_2 males produced by breeding F_1 sows and herniated boars were 45.90 per cent herniated, and 43.18 per cent of the males in the third generation similarly produced had inguinal hernias.

These results indicated that the condition of inguinal hernia is definitely inherited, and a 2-factor hypothesis was tentatively suggested to account for the mode of inheritance, the double recessive males being herniated while the females were normal. A minor influence of environmental effects is suggested.

The dependence of secondary sex-characters upon testicular hormones in Lebistes reticulatus, L. J. Blacher (*Biol. Bul. Mar. Biol. Lab., Woods Hole, 50 (1926), No. 5, pp. 374–381, figs. 13*).—In experimental work with *Lebistes reticulatus* at the Biological Laboratory of the Zoological Garden at Moscow six male fish were observed which gradually lost their male secondary characteristics, such as size and the black, red, and yellow pigment spots. Dissection of these individuals showed that the testicles were either absent or were greatly atrophied. It is, therefore, concluded that with the disappearance of the male sex hormones the sex characters approach the female type.

In another fish, which in external appearance bore certain resemblances to both sexes, the gonad was found on sectioning to possess a well-developed ovary with embryos nearly ready to be born and with a well-developed testicle adjacent. The colors of the hermaphrodite were those carried in the X chromosome, but none of those common to the Y chromosome of Winge (E. S. R., 48, p. 765) were present, indicating that the hermaphrodite lacked the Y chromosome and was, therefore, genetically a female.

A sex difference in linkage in rats and mice, W. E. Castle (*Genetics, 10 (1925), No. 6, pp. 580–582*).—Data are cited from ten experiments, nine being from Detlefsen (E. S. R., 53, p. 523), with rats and mice in which not less than 1,000 young were produced in each, which showed that the amount of crossing over between the dark-eye and color genes was always greater in females. The excess of crossovers exceeded the probable error by 1 to 2 times in 5 experiments, 2 to 3 times in 2 experiments, 5 times in 1 experiment, and was 7 times greater than the probable error in another experiment. It is also pointed out that the probable errors were larger than those calculated by the usual methods. It is, therefore, concluded that crossing over in this region is more frequent in female than in male rats and mice, though the differences as found in individual experiments might not be considered significant.

The third linkage group in Oenothera, G. H. Shull (*Natl. Acad. Sci. Proc., 11 (1925), No. 12, pp. 715–718*).—In 1921 the author found, it is stated, in cultures of *O. lamarckiana* a new flower color which was designated as old gold (vetaurea) and which is here treated as the first discovered factor of a third linkage group in Oenothera. The discovery of this third linkage group in Oenothera is expected to be valuable in rationalizing interpretations of genetical phenomena in this genus, and may prove a most important factor in determining the validity of the suggestion, credited to R. E. Cleland, that chromosome cohesions may constitute a cytological basis of linkage and crossing over in this group of plants, and offered as an alternative to the hypothesis favored by Shull that linkage in the Oenotheras results, as in other organisms, from the inclusion of the linked genes within a single chromosome pair. "Coordinated genetical and cytological studies on material characterized by three groups of linked genes will present a number of critical tests which should make it possible to decide promptly which of the two rival hypotheses is correct."

The linkage of pubescent node and beard factors as evidenced by a cross between two varieties of wheat, E. F. Gaines and A. Carstens (*Jour. Agr. Research [U. S.], 33 (1926), No. 8, pp. 753–755*).—Observations in the F_1, F_2, and F_3 generations of a cross, Hybrid 128×Velvet Node wheat, grown at the Washington Experiment Station, led to the conclusion that linkage exists between the beard and pubescent node factors and in such degree that about 5 per cent of crossing over occurs.

Hybrid vigor in rice, J. W. Jones (*Jour. Amer. Soc. Agron., 18 (1926), No. 5, pp. 423–428*).—F_1 rice hybrids at the Biggs, Calif., Rice Field Station exhibited heterosis in height of plants, number of culms per plant, and yield per plant, whereas little evidence of hybrid vigor was seen in length of panicle.

Studies in twin resemblance, C. E. Lauterbach (*Genetics, 10 (1925), No. 6, pp. 525–568, pls. 5, figs. 3*).—The author has made studies of the relation between various body measurements and characteristics, including intelligence tests, of 212 pairs of twins, varying in age from 90 to 238 months. Among the twins there were 71 pairs in which both were boys, 78 pairs in which both were girls, and 63 pairs consisting of one girl and one boy.

The results of the study, which are discussed in relation to the findings of other investigators, have led to the conclusion that twins resemble each other more closely than other sibs, and that those of like sex show a greater resemblance than those of unlike sex. The resemblance between the latter was similar to that found among single sibs. Age did not appear to affect the degree of resemblance between twins. Certain characteristics showed variations in the resemblance. A considerable proportion of the monozygotic twins showed symmetry reversal in handedness, head-hair whorls, etc., and variability in the palm pattern. Similar conditions were observed in dizygotic twins, and in certain cases similar palm patterns were observed in the latter type.

The resemblance between twins, a statistical examination of Lauterbach's measurements, R. A. Fisher (*Genetics, 10 (1925), No. 6, pp. 569–579*).—The author has made a statistical study of the significance of the relation between the standing and sitting height, weight, and cephalic index of the pairs of twins on which the data are presented in the above paper, from which similar conclusions have been reached.

The correlations for the various measurements of unlike twins ranged from 0.38 to 0.54, but for like twins they ranged from 0.57 to 0.74. A study of the heterogeneity of the pairs classified as monozygotic indicated that there were some dizygotic twins in this group, since they were divisible into at least two groups on the basis of resemblance, and only about 59 per cent were thus classified as monozygotic. If this assumption is true the correlation between the identical pairs must be approximately 0.9.

Sole patterns of twins, R. B. Montgomery (*Biol. Bul. Mar. Biol. Lab., Woods Hole, 50 (1926), No. 4, pp. 293–300, fig. 1*).—An analysis has been made of the sole patterns of 87 pairs of twins living in the vicinity of Madison, Wis., to see if monozygotic twins may be identified by this means. The patterns, which were classified by the Wilder method, were identical in 13 sets of twins, of which 12 sets were of the same sex. Of 38 pairs of sibs studied in addition to the twins, only one pair of sisters had similar patterns. The author concludes that the presence of identical sole patterns points toward a monozygotic origin in twins, but that their absence does not disprove it.

FIELD CROPS

New methods with check plats, C. K. McClelland (*Jour. Amer. Soc. Agron., 18 (1926), No. 7, pp. 566–575, figs. 2*).—The author describes and illustrates the application of methods for adjustment of yields termed "the weighted check" method and "the average percentage value" method.

[Forage crops experiments in Florida, 1920], J. M. Scott (*Florida Sta. Rpt. 1920, pp. 16–19, fig. 1*).—Experimental activities are reported on these pages continuing previous investigations (E. S. R., 54, p. 230) and preceding work already reported (E. S. R., 48, p. 298; 49, p. 823).

Cultural and pasturing studies demonstrated that Bahia grass (E. S. R., 43, p. 528) will spread and make a complete sod under pasture conditions, and that cattle like it. Bahia grass seems best adapted to a rather moist soil but may not be of value when planted on dry, sandy land or successful on land subject to overflow. It is rather sensitive to cold, but the roots do not appear to be injured by frosts or light freezes. Fertilizer tests with sweet potatoes demonstrated the need for potash if maximum yields are to be expected. The response of Japanese cane to different fertilizer mixtures is shown.

[Crop experiments at the Moses Fell Annex Farm, Bedford, Ind.], H. J. Reed and E. W. Moore (*Indiana Sta. Circ. 135 (1926), pp. 7–10*).—Seeding tests with clover and sweet clover, and fertilizer trials on pastures are described as heretofore (E. S. R., 53, p. 431). The crop varieties averaging highest in yields included Purkoff, Michigan Amber, and Fultz wheat, Mammoth Winter and a local rye, Purdue 21 barley, Johnson County White and Alexander Gold Standard corn, and Minota, Swedish Select, and Iowa 103 oats.

[Field crops experiments in Kentucky, 1925] (*Kentucky Sta. Rpt. 1925, pt. 1, pp. 13, 14*).—While average field applications of fertilizer salts carrying chlorine increase the chlorine content of Burley tobacco, this did not seem an important factor affecting the quality of the tobacco.

Wheat averaged 20 bu. per acre where limestone and phosphate were applied and 7 bu. on untreated soil, and similarly treated clover yielded 2,350 lbs. and 300 lbs., respectively. Certain clover selections have exhibited a high degree of resistance to mildew.

Close cutting second year growth of sweet clover after the stand had attained enough growth for hay continued to result in the death of practically all plants. Cutting high, 5 to 10 in., allowed more or less branch development, which was found to vary inversely with the seeding rate and maturity stage and directly with the height of stubble left. If correctly handled, the crop may be made to yield both hay and pasture, or pasture and seed, or pasture, hay, and seed the second year. Pasturing tests with milk cows suggested that each acre of sweet clover (allowed a good start before being pastured) nearly equaled 3 acres of blue grass during a dry summer.

For soy bean hay heavy seedings appeared advisable, the stems being finer and the hay curing more readily and being more palatable. The forage cured much more readily if cut soon after pod formation. The most practical way of curing hay for home use is to permit it to lie in the swath, as it cures more rapidly and the quality is not seriously injured. Under average conditions, curing will require at least a week. Soil known to be well supplied with bacteria was found to be equal, if not superior, to the commercial cultures for inoculating soy beans.

[Crop experiments in Maryland] (*Maryland Sta. Rpt. 1925, pp. VIII, IX*).—Varietal studies during from 20 to 34 years recommend smooth wheats, such as Currell, Leap, and Fultz, for the Piedmont Plateau region, and the Fulcaster type, such as Mammoth Red, Bearded Purplestraw, and Miracle, for the Coastal Plains and limestone valleys. Wheat after corn seemed the most practical rotation on most farms, and with proper culture and fertilization, need not result in low yields. On farms where considerable manure is used on corn a fertilizer high in phosphoric acid and potash has proven most efficient. On typical wheat soils a 2–12–4 fertilizer has produced the best yields. Wheat after soy beans for hay has outyielded wheat after corn.

Virginia and Wilson soy beans continued to lead about 50 varieties as best adapted to Maryland conditions. For seed, planting in rows 28 in. apart and giving some cultivation was preferable, but where cultivation is not feasible

rows 14 in. apart are indicated. In a comparison of soy beans seeded with cowpeas, millet, or Sudan grass for hay, results favored the Sudan grass mixture, as the yield was higher and the seeding cost much less.

Hay, pasture, and lawn grass tests gave results indicating that for pastures on the hilly land orchard grass, tall meadow oat grass, red fescue, and sweet vernal may be considered satisfactory; on the slopes and mountain valleys white clover and lespedeza (Japan clover) may be added. At the station Kentucky blue grass and orchard grass have proven best for pastures. For hay a combination of alsike clover, alfalfa, and timothy seemed much more profitable for yield and quality than the growing of clover and timothy alone. Top-dressing with 20 to 30 tons of ground limestone may stimulate blue grass enough to crowd out crab grass.

[Agronomic experiments in Montana] (*Montana Sta. Rpt. 1925, pp. 8–12, 22–24, 28–30, 33–35, 38–44, 47–49, figs. 15*).—The leading varieties (E. S. R., 54, p. 327) of winter and spring wheat, barley, oats, corn, and alfalfa are indicated from test results at the station and substations. Sunflowers surpassed corn for silage in the mountain valleys. The best flax-wheat mixture, 14 and 30 lbs., respectively, per acre, produced more than these crops grown alone. Hoary cress (*Lepidium draba*) and Russian knapweed, potentially troublesome weeds, were reported from several localities in the State, and control methods are suggested.

Seed potatoes, 2 oz. or larger, yielded decidedly better than smaller seed and resulted in more stalks, more tubers per hill, and more tubers weighing from 2 to 12 oz. By a method outlined, the 2-man potato planter can be used in planting tuber units.

Germination tests of wheat kernels frozen at different development stages (E. S. R., 54, p. 737), made in comparison with similar but nonfrozen wheat, gave evidence that very immature wheat under favorable conditions germinates nearly 100 per cent. Freezing, however, practically kills the germs in such wheat and reduces germination to about 50 per cent or less in kernels containing 43 to 50 per cent of moisture. Moreover, this germination seemed to decrease as the frozen kernels aged. Baking tests made with this wheat showed that when wheat kernels 21 to 25 days from fertilization, containing 50 to 56 per cent of moisture, were frozen, the flour made therefrom was markedly reduced in quality. At 38 days from fertilization, however, and containing 34 per cent of moisture, frozen wheat gave a flour as good as that from nonfrozen wheat at the same development stage. The immature wheat did not yield as good flour as that from the more mature.

Application of manure or the inclusion of alfalfa in the rotations was followed by enhanced yields of sugar beets and potatoes at the Huntley Substation (E. S. R., 55, p. 132). Corn has been a good crop on irrigated land and on the dry lands in the Yellowstone Valley. Investigations under the latter conditions proved that corn fits readily into the cropping systems of farms with enough livestock to utilize the crop. Small grain and flax on disked corn land returned yields about midway between those from continuous cropping and those after fallow. Rotations including corn produced more total grain and a higher average acre yield of grain than similar rotations without corn.

Wild oats heavily infested those plats at the Judith Basin Substation continuously cropped to small grain or in manured rotations with only one cultivated crop in 3 years, whereas few or no weeds appeared in plats summer fallowed every second year in a 3-year rotation with a cultivated crop omitting manure, or in 5- and 6-year rotations including legumes or grass for 2 or more years. Delaying spring seeding until after the early weed growth is destroyed

by cultivating with such an implement as the duckfoot cultivator was found to permit a practically weed-free crop to be grown that season. Seeding early and with the ordinary drill brought the largest returns from spring grain, while winter wheat produced much better when furrow drilled. Spring harrowing did not increase yields of either spring or winter wheat but does destroy weeds in furrow-drilled winter wheat. Seeding rates are indicated for wheat, oats, barley, and flax. Manure and heavy straw mulch has increased alfalfa yields.

Delaying seeding until May 1 and destroying all weeds that start by thorough surface cultivation has controlled Russian thistle at the North Montana Substation. Wheat so grown yielded higher, and the grain averaged superior in quality.

[Agronomic experiments in Pennsylvania], D. E. Haley, O. Olson, C. F. Noll, et al. (*Pennsylvania Sta. Bul. 204* (1926), pp. 6, 11, 12).—Applications of 300 lbs. of ammonium sulfate tended to increase the nicotine content of *Nicotiana rustica* (E. S. R., 54, p. 328) grown on light soils somewhat acid. A further 300 lbs. added 3 weeks after the first resulted in a lowered nicotine content. An increase in nicotine content always followed an increase in the application of sodium nitrate. Strains of Pennsylvania Broadleaf or Seedleaf tobacco developed at the Ephrata Substation yielded from 1,850 to 2,050 lbs. per acre and contained from 4.85 to 6.25 per cent of nicotine, whereas yields of strains obtained from farmers produced from 1,400 to 1,800 lbs. and contained from 5.04 to 5.75 per cent of nicotine.

Hardy alfalfas averaged 480 lbs. more hay per acre annually than common alfalfa from different parts of the United States. Northwestern common did not surpass common from Kansas, Arizona, and Utah. Chilean and Peruvian alfalfas suffered more winter injury than other sorts, and these and Turkestan gave low average yields.

Wyoming forage plants and their chemical composition.—Studies No. 7, Effect of altitude, seasonal variation, and shading experiments, E. N. Roberts (*Wyoming Sta. Bul. 146* (1926), pp. 35–89, figs. 25).—Continued investigations (E. S. R., 41, p. 333; 52, p. 368) were concerned with the effects of altitude, seasonal variation, and shading on the composition of grasses and other forage plants.

Increase in altitude generally caused a marked increase in crude protein, increase in N-free extract, and a gradual increase in caloric value, while the crude fiber decreased and the contents of ether extract and ash were apparently not affected. The crude protein : N-free extract ratio seemed to be maintained at an approximately constant level or decreased slightly.

As the season advanced the forage plants showed in general a decrease in crude protein, an increase in N-free extract, ether extract, and the crude protein : N-free extract ratio. While fiber and ash contents varied somewhat with the species, about two-thirds of the samples showed an increase in ash with advance of season.

Shading markedly affected the forage grasses in causing an increase in crude protein, a decrease in N-free extract, and in most cases an increase in ether extract and ash content. The effect on crude fiber was not so consistent. Shaded grasses showed a narrower crude protein : N-free extract ratio than unshaded grasses.

Conclusions of practical importance are that western forage plants increase in feeding value with increase in the altitude at which they are grown, that the forage plants studied are generally less valuable for hay when cut unduly late in the season, that the introduced grasses, timothy and red top, suffer the most rapid loss in feeding value as the season advances, and that the native

sorts, such as wire grass and *Carex* spp. suffer the least loss in feeding value from late cutting.

[Agronomic and plant breeding investigations in Bombay, 1924–25], G. B. PATWARDHAN (*Bombay Dept. Agr. Ann. Rpt. 1924–25, pp. 139–147*).—This research has dealt with practically the same projects as noted earlier (E. S. R., 54, p. 231).

Corn experiments, 1925, South Mississippi Branch Experiment Station, E. B. FERRIS (*Mississippi Sta. Circ. 64 (1925), pp. 6*).—Experiments with corn reported on for 1925 comprised fertilizer trials, study of the residual effect on corn from fertilizers applied to cotton for 5 years, the effects on yields of corn and legumes (E. S. R., 55, p. 228) grown alone and in combination, variety tests, and rotations.

Relation of breaking strength and other cob characters to yield of corn, F. L. WINTER (*Jour. Amer. Soc. Agron., 18 (1926), No. 7, pp. 592–596*).—The relation between cob-breaking strength and the yield of corn was studied in five strains of corn at the Illinois Experiment Station. The data obtained indicated that each strain has a distinct average cob-breaking strength, and that a positive relationship exists between this breaking strength and the yield when strains are compared. A positive correlation seemed apparent between either pink or red coloration of the ligneous part of seed-ear cobs and average yield and a negative correlation between brown coloration of the ligneous part of seed-ear cobs and average yield. Such relationships might be of a certain value in choosing seed for planting.

Correlations of seed, fiber, and boll characters in cotton, T. H. KEARNEY (*Jour. Agr. Research* [*U. S.*], *33 (1926), No. 8, pp. 781–796, figs. 2*).—This contribution from the Bureau of Plant Industry, U. S. D. A., presents information in regard to the correlations existing among the characters of the bolls, seeds, and fiber of cotton. Numerous determinations were made at Sacaton, Ariz., on Pima and other varieties of the Egyptian type and on an F_2 population of an upland × Egyptian hybrid. Published data of other investigators working chiefly with upland cottons are also cited.

Study of off-type plants of Acala cotton, R. D. MARTIN (*U. S. Dept. Agr., Dept. Circ. 390 (1926), pp. 11, pls. 5*).—Studies of progenies grown at Sacaton, Ariz., from Acala cotton plants off-type in leaf, stalk, and fruiting branch characters and also in a series of progenies from Acala plants that were typical except for small bolls, short and sparse lint, and seed characters such as dark fuzz, green fuzz, and naked seeds with little or no fuzz, seemed to show that the divergent characters were inherited. The information is presented to emphasize the need of careful and continued selection in cotton and to assist in the recognition of off-type plants in the roguing of fields where seed is grown for planting.

Cotton experiments, 1925, South Mississippi Branch Experiment Station, E. B. FERRIS (*Mississippi Sta. Circ. 63 (1925), pp. 7*).—Varietal leaders according to acre value in 1925 included D. & P. L. No. 4 and No. 5, Delfos 911, Delfos 631, and Lone Star 65. Lone Star, Trice, and Delfos have led in average acre value during the period 1921–1925. The progress of fertilizer trials and boll weevil control methods with cotton is reported. Unthinned and 11-in. spacing and April 4 and 11 plantings resulted in the highest yields of seed cotton.

[Report of the Administrative Council of the Empire Cotton Growing Corporation] ([*London*]: *Empire Cotton Growing Corp., 1926, pp. 32*).—The activities of the organization in furthering cotton production and research in various divisions of the British Empire are summarized for the year ended March 31, 1926.

A chemical and physiological study of maturity in potatoes, C. O. Appleman and E. V. Miller (*Jour. Agr. Research* [*U. S.*], *33* (*1926*), *No. 6, pp. 569–577, fig. 1*).—Observations at the Maryland Experiment Station on Irish Cobbler tubers dug at six growth stages from full bloom to vines brown and dry indicated that the ripening and maturing processes in potatoes may continue during storage, so that by the end of the rest period immature potatoes large enough for seed have practically the same percentage composition and respiratory response as potatoes allowed to mature on the vine, if both are stored under the same conditions. No chemical or physiological basis for the superiority of immature potatoes for seed was apparent. Reported cases of immature seed surpassing mature seed may have been due to greater freedom from degeneration diseases in the immature seed.

Germination of rice seed as affected by temperature, fungicides, and age, J. W. Jones (*Jour. Amer. Soc. Agron.*, *18* (*1926*), *No. 7, pp. 576–592*).—Information on the germination of rice under water and as affected by different temperature and other conditions, as derived from the experiments here reported, largely conducted at the University of California in 1923 and 1924, is of practical interest, since in California (E. S. R., 55, p. 34) a considerable rice acreage is sown broadcast and immediately submerged.

Seeds of certain rice varieties seemed more resistant to deterioration during long exposure under water at low temperatures than seed of other sorts, Colusa, Wataribune, and Early Prolific appearing the most resistant of the 8 varieties tested. Exposure of 8 hours under water at from 100 to 118° F. in each 24-hour day greatly reduced the germination of Caloro seed, while 2, 4, and 6 hours' exposure each day did not affect germination noticeably. Exposure of moist rice seed for 1 and 2 hours at 122 and 130° had no appreciable effect on germination. Exposure for 1 hour at 152° materially reduced the germination of seed of both Caloro and Colusa, a 2-hour exposure practically killed all seeds of both sorts, and a 3-hour exposure entirely killed all seeds of both varieties.

Exposure of dry rice seed for 1 hour at 122, 130, 140, 150, and 158° did not affect germination, whereas a 1-hour exposure at 170° appeared to reduce the germination of Caloro seed, a 1-hour exposure at 190° greatly reduced the germination of both Caloro and Colusa rice, and at 205° all seeds were killed. Rice seed germinated very well when subjected to a temperature range of from 42 to 117° or from 65 to 71° during the germination period. Some varieties were observed to germinate sooner than others and all varieties to germinate quicker at high than at low temperatures. Rice seed germinated about equally well at constant temperatures of about 61, 68, 86, 88, 93, and 100°, but at 108° no seeds of Colusa and only few of Caloro germinated, and at 122° all seeds of both varieties were killed.

Treatment of seed with copper carbonate dust, a 1:40 solution of copper sulfate, or a 1:400 solution of Uspulun prevented the growth of fungi and in some cases appeared to stimulate the germination of rice seed submerged in Petri dishes. Seed treated with these fungicides made better stands under field conditions, but such stands may have been due to factors other than seed treatment. Copper carbonate appeared toxic to some seedlings after germination.

The seeds of some rice varieties appeared to deteriorate with age faster than others. Three-year-old seed of 5 varieties tested ranged in germination from 85 to 99 per cent, while 3 other sorts ranged from 19 to 72 per cent. The vitality of rice seed more than 3 years old is likely to be low. The percentage of germination of rice seed harvested at different development stages increased with advance in maturity from the milk to the dead-ripe stages. Brown hulled

and dehulled kernels and dehulled and hulled half kernels of rice appeared to germinate well under favorable conditions, whereas immature seed usually is low in vitality.

Metrical attributes and the physiology of hardy varieties of winter wheat, K. H. Klages (*Jour. Amer. Soc. Agron., 18 (1926), No. 7, pp. 529–566, figs. 8*).—Certain physical and physiological properties of winter wheat were studied at the University of Illinois to determine the degree of association existing between them and winter hardiness. Factors involved in the development of winter wheat and the relative behavior of spring and winter varieties were also considered.

Measurement showed that most hardy varieties of winter wheat have a comparatively small leaf area in autumn. While leaf area is not an absolute index to hardiness at Urbana, it appeared to be worthy of consideration in selecting hardy types. Close and constant correlations were found to exist between area of the seed leaf, width of the seed leaf, width of widest foliage leaf, and total leaf area of the plant. Since width of seed leaf is most easily and accurately determined, it was considered the best criterion of leaf area. The correlation of the width of the seed leaf and total leaf area in the tillering stage in greenhouse plants was $r=0.843\pm0.015$ and for field-grown plants $r=0.8\pm0.012$.

Measurements of widths of seed leaves did not seem of value in the selection of hardy types of winter wheat in so far as the magnitude of the leaf area exposed by plants stands in relationship to hardiness. Variations in growth habits do not stand in absolute relationship to hardiness. An erect habit of growth apparently better indicated lack of resistance than a recumbent growth habit indicated hardiness. The data showed that the amount of tillering of a variety in autumn is not indicative of its hardiness.

Hardy varieties of winter wheat showed a slower growth rate in the field in autumn than nonhardy varieties. However, due to varietal characteristics, the amount of material produced by the several varieties is not in direct proportion to their degrees of hardiness. Since the weight of a plant in autumn is closely associated with the extent of its leaf area, the conclusions relative to the connection of leaf area to hardiness also seemed to apply here.

The rhythm in the development, as ordinarily observed in the growth of winter wheat, is apparently an enforced rhythm. Low temperatures and low intensities of light constitute the limiting factors in the growth of winter wheat in autumn. The behavior of winter wheat grown in the greenhouse and especially that of plants grown in the greenhouse with the aid of electrical illumination seemed to preclude the autogenous explanation for the occurrence of a period of dormancy. Exposure to low temperatures did not seem essential to the normal development of winter wheat. Winter as well as spring wheats quickly responded to the application of artificial (electrical) illumination, spring wheats being more exacting in their light requirements than winter wheats.

Trumbull and Fulhio wheat best for Ohio farms, L. E. Thatcher (Ohio *Sta. Bimo. Bul., 11 (1926), No. 5, pp. 172–177, fig. 1*).—Results obtained at the station and on experimental farms in Ohio indicate that Trumbull and Fulhio wheats (E. S. R., 49, p. 738) have surpassed other wheats generally grown in the State, and the rapid increase in acreage shows them to be satisfactory to Ohio farmers.

Trumbull is noted for stiffness of straw, early maturity, freedom from loose smut, comparative freedom from stinking smut and scab, nonshattering of grain, high quality of grain and flour, and good average yields. Its tendency

to winterkill in unfavorable situations, where drainage is poor and when seeded late on thin land, can be reduced decidedly by timely seeding and by liberal use of fertilizer or manure on spots where winter injury is probable. Fulhio is somewhat more winter hardy, stools better, and averages a little higher in yield than Trumbull and will succeed where Trumbull winterkills. It equals Trumbull in time of maturity, nonshattering of grain, and quality of grain and flour, but is slightly inferior in strength of straw and disease resistance.

Fertilizers for wheat, R. M. SALTER (*Ohio Sta. Bimo. Bul., 11 (1926), No. 5, pp. 163–171, fig. 1*).—Field experiments (E. S. R., 49, p. 738) involving the use of fertilizers on wheat in 14 counties in Ohio during from 7 to 32 years showed that acid phosphate used alone returned a profit in each test. On many soils profits yet larger may be expected from either potash-phosphoric acid mixtures or complete fertilizers. In most of the tests the return from the phosphoric acid was higher than for the same investment in potash and nitrogen. Increasing the relative amount of phosphoric acid and reducing the nitrogen and potash seemed to increase the profit from the fertilizer combinations. Wheat could receive about two-thirds of the total fertilizer for the rotation and corn the remainder. A good standard acre application for wheat seems to be about 400 to 500 lbs. of a fertilizer containing about 16 per cent total plant food or its equivalent. On livestock farms producing manure enough to apply 10 to 12 tons per acre in a 4-year rotation, acid phosphate alone should supply the commercial fertilizer for the wheat. Ohio standard fertilizers are indicated for wheat on several soil types.

HORTICULTURE

[Horticultural investigations at the Montana Station] (*Montana Sta. Rpt. 1925, pp. 30, 31, 35, 36, 44–46, figs. 3*).—Observations upon celery plants grown under warm, medium, and cool temperature conditions showed approximately 50 per cent of premature seeding in plants grown in cool environment with none in the warm and medium temperature lots. Early transplanting to the field, May 21, as compared with June 16, did not induce seeding in the warm and medium temperature lots. Lettuce set in the field as early as the weather permitted was of better quality and made firmer heads than later plantings.

Long continued soil-management studies at the Horticultural Substation at Victor further demonstrated the inadvisability of maintaining continuous clean culture in orchards. Red clover proved an excellent crop for building up the soil, but should be followed by a perennial such as alfalfa, alsike, or Dutch clover rather than by an intervening year of clean tillage. Nitrate of soda proved beneficial to clean cultivated orchards and aided in establishing cover crops. Cultural tests with lettuce indicated the possibility of growing two commercial crops each year. Staking and pruning proved beneficial in tomato production.

Shelter belt tests at the Judith Basin Substation showed that Caragana, box elder, and green ash are hardy and vigorous growers. Northwestern poplar, although short lived, is considered a valuable ingredient of the shelter belt on account of its very rapid growth. Pruning of any kind decreased the efficacy of the shelter belt plantation.

[Horticultural investigations at the Pennsylvania Station] (*Pennsylvania Sta. Bul. 204 (1926), pp. 5, 6, 15, 27–32, figs. 3*).—Studies by D. E. Haley and W. S. Clark on stored apples grown under different fertilizer treatments showed that in a single variety red fruit had greater acidity than green fruit, the acidity being greater in the flesh just below the red coloration. Baldwin apples fer-

tilized with muriate of potash failed to keep as well as those treated with sulfate of potash. The permeability of the cells of the muriate lot was lower than that of the sulfate lot. Baldwins grown under good fertility conditions showed a greater acidity and permeability of cells than did those grown under poor conditions. In general, acidity decreased with the length of the storage period.

Comparisons by J. B. Hill of the ovule and pollen fertility in F_1 species hybrids of Digitalis showed that both pollen and ovules are relatively sterile in cases of high sterility. In combinations in which the F_1 showed some fertility there was little correlation found between the degree of ovule and pollen fertility.

Orchard management studies by R. D. Anthony emphasized the need of applying nitrogen to sod orchards. Nitrates applied at the time of bud swelling were quickly taken up by the tree and also stimulated a heavy grass cover crop. In certain mature sod orchards the use of 10 lbs. of nitrate of soda proved profitable. A good growth in the orchard cover crop is deemed necessary to the maintenance of sustained production in mature orchards. Studies by L. M. Marble and Anthony of above-ground and bank cellar storages showed that both can keep apples successfully through their usual commercial season.

As reported by W. Thomas and Anthony, applications of complete fertilizer to apple trees grown in iron cylinders, under carefully controlled conditions, showed much greater effect on sod than on tilled trees, the increases in the season's growth above check sod and check tillage being 117 and 23 per cent, respectively. There was, however, relatively little difference in the average season's growth between fertilized trees in tillage and in sod. The ratios of starch to total nitrogen and of total carbohydrates to nitrogen indicate that the nitrogen supply is decidedly too low in the check sod trees to utilize properly the stored carbohydrates. Tillage alone increased the nitrogen supply, but not sufficiently to utilize carbohydrates advantageously. The ratios of total carbohydrates to total nitrogen for check sod, check tillage, N P K sod, and N P K tillage, in one-year wood were 276, 122, 71, and 85; in one-year bark 49, 34, 32, and 26; and in leaves 23, 19.3, 15.9, and 15.6, respectively. The ratios of total nitrogen to phosphoric acid in check sod, check tillage, N P K sod, and N P K tillage were in wood 6.7, 10.9, 19, and 16, and in bark 25.3, 26, 31.4, and 30, showing the lack of a physiological balance in the unfertilized trees and indicating that nitrogen is supplied at a rate lower than is required for the utilization of available phosphoric acid. Apparently the C/N and N/P_2O_5 ratios are a valuable index as to the relative excess or deficiency of nitrogen and phosphoric acid. It is deemed likely that a determination of the composition of the leaves alone may be sufficient evidence. Finding no correlation between the potash content of leaves, wood, or bark and growth, the authors concluded that the soil used contains sufficient potash for young apple trees. No advantage was gained by studying 2-year-old wood, as the composition is of the same relative order.

Studies by F. N. Fagan indicated that the selection of framework branches by disbudding undesirable shoots is a valuable practice in the apple, but of no particular advantage in the peach.

In vegetable breeding studies by C. E. Myers, self pollination of individual cabbage plants failed in practically every case to yield seed. Observation of the progeny of tomato crosses indicated that, in respect to fruit size, Yellow Cherry, Red Currant, and Yellow Plum are dominant over large fruited varieties. Crosses made by M. T. Lewis between Golden Yellow Stonehead and Mignonette lettuces yielded seedlings in which the color was more intense than in either parent. Observations by W. B. Mack upon cabbage replants showed

that many of these failed to mature or made small, inferior heads. A statistical study of the value of check plats for correcting plat yields for soil variability showed no consistent reduction of variability after correction by the yields of the nearest checks. As compared with other fertilizers, phosphorus gave consistent gains for all vegetables, particularly tomatoes. The largest yields were, however, produced on the barnyard manure plats.

An experiment on the winter-killing of vegetable crops in market gardens, T. WALLACE (*Jour. Pomol. and Hort. Sci., 5 (1926), No. 3, pp. 205–209, pl. 1*).—Difficulty in wintering over vegetables in market garden soils which had been in use for several years was overcome by the liberal application of potassic fertilizers. The author believes that the excessive use of animal manures year after year had brought about an unbalanced nutrient ratio, namely, too much nitrogen in proportion to potassium.

The mica ink-cap or glistening Coprinus, F. C. STEWART (*New York State Sta. Bul. 535 (1926), pp. 3–30, pls. 3*).—Information of a popular nature is offered upon the mushroom species *C. micaceus*, found rather common about old stumps or buried wood and considered of real merit as an edible form. Experiments showed that from 72 to 74 per cent of liquid is produced by a given weight of mushrooms during autodigestion. The pure liquid is reddish brown, but usually appears black due to the admixture of spores and particles of the undigested residue.

Effect of nutrition on the number of blossoms per cluster and the dropping of blossoms in the tomato, H. R. KRAYBILL (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 371–374*).—Records taken at Arlington Farm, Virginia, upon the performance of the first and second flower clusters of Stone tomato plants set April 17, 1918, in pots of soil obtained from a Maryland field in which considerable dropping of blossoms had occurred the preceding season showed that modifications in fertilizer treatment may materially affect the number of blossoms, the number of developing fruits, and the number of abscising blossoms per cluster. The highest average number of blossoms per cluster in the unfertilized plants was 3.5, while none of the fertilized plants averaged less than 5. Control plants in one case dropped 73.3 per cent of their blooms, as compared with a maximum of 20 per cent in the fertilized plants.

An experiment in propagating apple trees on their own roots, E. C. AUCHTER (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 205–211, pl. 1*).—Marked success was obtained at the University of Maryland in an attempt to propagate own-rooted apple trees. In all cases long scion (16 to 20 in.) and very short roots (2 to 3 in.) were used, and the grafts, after storing in sand, were planted very deep. Of 400 Stayman Winesap, 250 York Imperial, and 100 Yellow Transparent grafts planted in the spring of 1922, 300, 130, and 40, respectively, produced excellent scion roots. Quite favorable results were obtained with Wealthy, Delicious, Stayman Winesap, and York Imperial in 1924. Where fine copper wire was twisted above the graft union with the hope that this might check the growth of seedling roots and encourage root formation from the scion, the results were inconsistent, being apparently beneficial only in the case of Wealthy and York Imperial.

The use of burr-knots in the vegetative propagation of apple varieties, C. F. SWINGLE (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 228–230*).—In again reporting the successful asexual propagation of apples normally producing burrknots (E. S. R., 54, p. 538), the author adds that histological studies have shown a close relationship between burrknots and vascular rays and the leaf and branch traces of the bud. Chemical analysis of 1-year-old shoots of mound-layered seedling apple trees showed little difference in the composi-

tion of those kept defoliated from June on and those with leaves intact, although there was a striking difference in the top and root growth in favor of the untreated shoots. The author concludes that root growth is dependent on top growth rather than on any differences in chemical composition. The possibility is suggested of hormone activity.

Some results of bending the branches of young apple and pear trees, L. H. MacDaniels and A. J. Heinicke (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 201–204*).—Studies carried on in the experimental orchard at Cornell University upon the effect of tying down the limbs of young, vigorous Northern Spy apple and Kieffer pear trees showed a marked stimulation in early fruiting, thus bearing out the results secured in California, by Caldwell (E. S. R., 46, p. 736), with pears and plums. In the case of moderately pruned Northern Spy trees which up to the time of treatment had borne practically no fruit, the yield per tree the season following treatment was 68±10 lbs. as compared with 8.5±2.7 lbs. for pruned trees and 35.2±6.7 lbs. for lightly pruned trees. These results show (1) that pruning delayed fruiting, and (2) that tying down the side branches more than counteracted the retarding effect of pruning. In respect to trunk growth the treated trees showed a slightly greater increment than the others. In the case of Kieffer trees, the tied branches were more resistant to breaking under the load of fruit than were normal branches. A search of the literature shows a reference to a similar practice in a treatise by Langley, published in 1729.

Effect of pruning upon fruit production (*Kentucky Sta. Rpt. 1925, pt. 1, pp. 15, 16*).—Lightly pruned apple trees yielded 45 per cent more fruit than did neighboring heavily pruned trees.

Further evidence of uncongeniality in disease-resistant stocks, J. A. McClintock (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 231, 232*).—The death during the summer of 1925 at the Tennessee Experiment Station and the West Tennessee Substation of peach trees worked on Marianna plum roots is deemed to be further evidence of the low value of the Marianna plum as a peach stock. Marianna plums and peach trees planted in the holes from which the dying trees were removed made a vigorous, healthy growth, indicating the absence of destructive pathological organisms.

[Peach varieties at the Moses Fell Annex Farm] (*Indiana Sta. Circ. 135 (1926), pp. 10, 11*).—Brief notes are given on the productivity and bud hardiness in 14 varieties of peaches planted in 1920 and fruiting for the first time in 1923.

The cold storage behavior of cherries, E. L. Overholser (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 54–58*).—Records taken on 51 varieties of cherries picked before, at, and succeeding the commercial harvest showed the following average optimum storage periods, namely, 14, 12, 8, and 4 days at temperatures of 32, 36, 45, and 67–75° F., respectively. At these temperatures the maximum storage periods were 22, 19, 14, and 7 days, respectively. Little difference was noted between the three picking dates in relation to keeping. However, the fruits of the second and third harvest were superior in quality and appearance. Individual data are presented for 23 varieties of cherries. In general the sour cherries did not store as well as the better keeping sweet varieties.

Some effects of pruning on grape production, J. H. Clark (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 80–84*).—Pruning studies at the New Jersey Experiment Stations upon Concord and Brighton grapevines showed that canes from 7 to 9 ft. in original length were the most productive, with those from 5 to 7 ft. next in order. The 7 to 9 ft. group was also most productive in respect to average yield per node. Although in 1925 the most productive

type of cane on Concord vines pruned to from 12 to 20 buds per cane apparently included those having an original length of over 9 ft., the author does not believe that a different type of cane should be chosen according to the severity of the pruning. Fairly consistent correlations between cane length and diameter and between cane length and internode length were recorded. Very little difference was found in the comparative percentages of developing buds on long and short canes.

Growth and yield of Concord grapevines, N. L. Partridge (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 84–87*).—An analysis of data obtained by the Michigan Experiment Station in two experimental vineyards in Van Buren County shows a distinct correlation between yield and vine vigor as measured in the weight of prunings annually removed. That the character of the soil has a direct bearing on this correlation is shown in correlation coefficients of 0.52±0.01, 0.45±0.01, and 0.59±0.01 for the years 1922, 1923, and 1924 in a fertile, loam vineyard and 0.74±0.01, 0.76±0.01, and 0.67±0.01 for the years 1923, 1924, and 1925 in a less fertile, sandy vineyard. The data emphasize the importance of increasing the vigor of the less thrifty vines, and the author points out that smaller returns may be expected from increases in the higher growth classes. The weight of prunings alone is not an infallible index to productivity, for fruitfulness is associated with other factors, such as the size of the preceding crop, soil conditions, etc.

Fruit-bud differentiation and subsequent development of the flowers in the Hicoria pecan, J. G. and N. C. Woodroof (*Jour. Agr. Research* [*U. S.*], *33 (1926), No. 7, pp. 677–685, figs. 7*).—Cytological studies at the Georgia Experiment Station upon pecan buds collected during the winter and early spring showed that differentiation of pistillate flowers occurs in terminal buds from February 15 to March 1. If the terminal bud has been destroyed before this time, one or more of the lateral buds may differentiate pistillate blooms. Pistillate blooms were found to develop rapidly and to reach a receptive condition in about 2 months after differentiation. Undeveloped pistillate flowers occurring at the time of pollination dropped without attaining a receptive condition. As the embryo sac is not mature at the time of pollination, it is concluded that fertilization does not take place immediately. Although varieties exhibited differences in the size, color, and shape of the stigmas, these could not be associated with any characters in the nuts. Staminate blooms were found to be differentiated in lateral buds from 6 to 12 months before the pollen was ripe.

Trees for roadside planting, F. L. Mulford (*U. S. Dept. Agr., Farmers' Bul. 1482 (1926), pp. II+50, figs. 29*).—Supplemental to an earlier publication (E. S. R., 55, p. 442) which discussed the location and the care of roadside trees, this paper presents information upon the kinds of trees suitable for the roadside, regions of adaptability, trees for special purposes, and detailed descriptions of various species useful for roadside planting.

FORESTRY

[Forestry investigations by the Pennsylvania Station], J. A. Ferguson (*Pennsylvania Sta. Bul. 204 (1926), p. 27, fig. 1*).—Cuttings in experimental plantations of black locust and catalpa planted in 1908 yielded 1,064 black locust and 340 catalpa posts per acre, thus establishing the superiority of the locust to the catalpa as a farm crop.

Age classes of western white pine planting stock in relation to aspect of planting site in northern Idaho, W. G. Wahlenberg (*Jour. Agr. Research*

[*U. S.*], *33* (*1926*), *No. 7, pp. 611–619, figs. 2*).—Planting investigations conducted on barren, burned-over slopes of from 25 to 30 per cent gradient and at an elevation of from 3,350 to 3,700 ft. with nursery stock of different ages showed the best survival in the older stock, namely, that which had been two years in the seed bed and two years in the nursery. The aspect of the site was quite as important as the kind of stock, the mortality being greatest on the western exposure. Sliding soil had a tendency to cover and kill trees, especially those in the youngest age classes. Height growth was, like survival, greatest in 4-year-old stock. On the basis of net cost of surviving trees, 2-year seedlings were most economical on moderate sites, and 4- and 3-year-old stock on less favorable sites.

Tables for determining contents of standing timber in Minnesota, Michigan, and Wisconsin (*Minnesota Sta. Tech. Bul. 39* (*1926*), *pp. 99*).—This bulletin contains 93 volume tables covering 25 forest species growing in the Lake States region. Of these tables, 31 are published for the first time and 15 are based upon data assembled by the Cloquet Forest Station of the Minnesota Station and the U. S. D. A. Lake States Forest Station. For certain species volume tables prepared in other regions are offered as temporary substitutes, in full realization of their inadequacy.

DISEASES OF PLANTS

Report of the plant pathologist, H. E. Stevens (*Florida Sta. Rpt. 1920, pp. 29–39*).—The work reported consists in the main of investigations of avocado diseases and their control.

Descriptions are given of black spot caused by *Colletotrichum* sp. and blotch due to *Cercospora* sp. It is claimed that both diseases can be controlled by the use of Bordeaux mixture, and apparently two applications are sufficient.

For the control of scab, three or four applications of Bordeaux mixture, one of which should be made when the trees are in bloom, are suggested.

Report of truck pathologist, C. D. Sherbakoff (*Florida Sta. Rpt. 1920, pp. 40–45*).—Tests are reported of six varieties of potatoes made to determine their resistance to brown rot, *Bacterium solanacearum*. In one series selections from Spaulding Rose did not show any rot, but in a second test none of the six varieties showed any resistance to the disease.

Experiments on the control of damping-off of celery in seed beds by treating the beds with a 0.5 per cent solution of copper sulfate showed that the disease was controlled, but some injury followed if the treatment was made during the warmer part of the day. When the treatment was made in the evening and the plants thoroughly sprinkled with water early the next morning, no injury resulted.

Studies were made of the Phytophthora which causes buckeye fruit rot of tomatoes and related species from other host plants. It was found that they would all attack tomato and castor bean plants, but with varying degrees of virulence. Some morphological differences between the species were also noted.

Observations by C. M. Tucker are said to show that seed treatment prevented watermelon wilt in the field, and that spraying with Bordeaux mixture controlled anthracnose. A leaf spot of watermelon caused by Alternaria is said to have been severe in several localities.

[Plant disease investigations at the Kentucky Station] (*Kentucky Sta. Rpt. 1925, pt. 1, pp. 12, 13, 14, 15*).—The results from tests made during the year are said to suggest that corn root rot and tobacco brown root rot may be caused by identical organisms. An examination of rotting tobacco roots

showed the presence of a Pythium-like fungus similar to that found in the roots of corn.

Studies on the longevity of the causal organisms of bacterial leaf spots of tobacco indicate that they die in the course of about 12 months. Tests with seed 18 months old gave results far more promising than seed treatment.

The eradication of perennial weeds capable of carrying mosaic disease from the permanent tobacco bed did not result in a reduction of initial mosaic infection in the field. Tests to determine whether or not chewing tobacco, which is used extensively by most tobacco men, is a source of mosaic infection at planting time suggest strongly that it is the important source of infection. Certain brands of commercial tobacco were found to carry mosaic, and tobacco as old as five years may still retain the virus in a virulent form.

A study of corn root rot has shown two distinct types of injury, seedling blights, due to seed-borne organisms, and true corn root rot, which may be produced experimentally by using old corn soil or by adding rotted roots from a continuous corn plat to sand cultures of fungus-free plants. The results of the experiments are said to indicate that *Gibberella saubinetii*, *Fusarium* spp., and probably *Diplodia zeae* are not concerned in the true corn root rot, and suggest strongly that the cause of this disease is a fungus of the Pythium type. A method is said to have been developed for producing corn seedlings, for pot culture work, that are entirely free from seed-borne fungi.

Observations to determine the relative susceptibility of varieties of apple to blight are said to show that the degree of infection is clearly correlated with severe pruning. The most severely infected varieties in 1925 were Domine, Lowell, Maiden Blush, Milam, Pewaukee, Rhode Island Greening, and Tolman.

Botany and plant pathology (*Pennsylvania Sta. Bul. 204 (1926), pp. 14, 15, 15–18*).—A summary account is given of investigations by E. L. Nixon on fire blight of the apple, a more detailed report of which has been noted (E. S. R., 55, p. 549). It is said that as a result of his investigations methods for propagating apple trees on their own roots and rapid determination of their immunity to fire blight have been discovered.

Investigations by R. C. Walton on the cause of frog-eye of apple are briefly reported, in which an attempt was made to produce the disease through leaf inoculations with every organism found associated with the disease. While no definite results were obtained from the artificial inoculations, the disease appeared abundantly under natural conditions and almost totally defoliated the trees by midsummer.

As a result of further studies by Walton, the perfect stage of the disease causing apple fruit spot is said to be a Mycosphaerella. Additional points about the life history of the organism were found. Among them, some leaf infection, and probably a high percentage, takes place while the foliage is still on the trees, the spots being overlooked in the fall because of the natural coloring of the leaves at that time of the year. It was found that fruit infection could take place much earlier in the spring and later in the fall than was formerly supposed, and humidity is believed to be a decided factor in producing fruit infection with conidia. The part that the ascospores played in producing infection of foliage and fruit has not been definitely determined.

A survey by W. S. Beach showed that probably the most important fungus parasite of mushrooms in Pennsylvania is *Mycogone perniciosa*. Soil sterilized with formaldehyde by a sprinkling method, and used for casing, gave good yields of mushrooms and apparently prevented Mycogone infection of the mushrooms. Sprinkling the bearing beds with various disinfectants usually prevented the further production of mushrooms.

Continuing his studies on the crown rot of rhubarb, Beach found additional evidence to justify the use of selected roots from diseased fields when roots from a disease-free source were not obtainable. Copper lime dust was found to check the spread of crown rot and was more convenient to apply than Bordeaux mixture.

Experiments with formaldehyde and other disinfectants for the control of lettuce diseases are briefly summarized, and it is stated that there was no evidence that fertilizers increased resistance or enabled seedlings to undergo transplanting with less loss. Seed bed treatments with 0.25 per cent solutions of Uspulun and Bayer compound and 0.5 per cent solution of Semesan gave only slight improvements in lettuce, the difference being too small to justify their use. Observations upon growth and weather factors with relation to Botrytis are said to indicate that the temperature extremes combined with rapid succulent growth are the most important factors in predisposing lettuce to an attack of this fungus in coldframes.

A brief report is given on infection experiments carried out with two bacterial organisms parasitic on Lima beans. The infections were readily secured with and without wounds. The organism producing red spots is said to agree with *Bacterium viridifaciens* in most of its cultural characteristics, while the one producing brown spreading spots appears to be *B. phaseoli*.

[Plant disease investigations], J. A. McClintock (*Tennessee Sta. Rpt. 1925, pp. 16, 17, 18, 19, figs. 2*).—The results obtained from growing apple grafts in steam-sterilized soil are said to indicate that crown gall bacteria in nursery soils are an important source of plant infection. Studies on aerial galls of both apples and quinces indicate that they are not of pathological origin but are abortive attempts at root formation. Western apple seedlings lined out at the station and budded in 1924 were dug and examined in the fall of 1925, and practically no crown gall had developed.

Inoculation tests with pure cultures of the fire blight organism are said to indicate that practically immune varieties of blight-resistant pears, apples, and quinces have been obtained.

Tests are said to have shown that nematode-resistant species of Prunus are available, but the practical use of these as stocks is complicated by a lack of congeniality between the resistant stocks and the commercial peach varieties which it was desirable to propagate.

Spraying experiments have shown that apple blotch and scab can be readily controlled by a 2-4-50 Bordeaux mixture, applied at 2-week intervals, three or four applications being made, depending upon varieties. Apple blotch producing twig canker in orchards was observed to be less serious where the trees had been sprayed for two seasons with Bordeaux mixture.

Tests in two commercial orchards in 1925 are said to indicate that cherry leaf spot may be held in check by thorough applications of 2-4-50 Bordeaux mixture, without injury to fruit or foliage.

A leaf spot of cruciferous plants caused by Alternaria herculea, J. L. Weimer (*Jour. Agr. Research [U. S.], 33 (1926), No. 7, pp. 645-650, pls. 2, fig. 1*).—A leaf spot of cruciferous plants caused by *A. herculea*, which is reported to be quite prevalent in the vegetable-growing section south of San Francisco, Calif., is described. The disease is said to be quite similar to that caused by *A. brassicae*, and is probably frequently confused with it. The parasitism of the fungus was demonstrated on cabbage, cauliflower, Chinese cabbage, and rutabaga.

Ozonium root rot, G. L. Peltier et al. (*U. S. Dept. Agr. Bul. 1417 (1926), pp. 28, pls. 11, figs. 2*).—The results are given of a study of the root rot of

cotton, alfalfa, and other plants in the southwestern portion of the United States.

I. *Studies of Ozonium root rot in Arizona and Texas*, G. L. Peltier and C. J. King.—The authors state that *O. omnivorum* appears to be indigenous in the soils of certain regions of the southwest section of the United States and yearly causes large economic losses, principally to cotton, alfalfa, and fruit trees in Texas and in certain irrigated valleys of New Mexico, Arizona, and southeastern California. A study of exhumed root systems of susceptible plants at various stages of infection is said to have given no evidence that the mycelium of the fungus spreads from plant to plant by underground contact of diseased with healthy roots, but rather indicates that the fungus usually progresses radially from a center through the soil, irrespective of the root systems, and attacks the plants in the line of the advancing mycelium. The plants are said to be generally attacked on the taproot within the first foot of soil, and the laterals usually rot from the point of attachment with the taproot.

The actual agent in the penetration of the roots is said to be the strand hyphae, which are found approximately from 38 to 75 cm. in advance of the wilting zone of plants. The hyphae composing the mycelial weft found on wilting plants appear to complete the breaking down of the roots and act as a reserve food supply for the advancing strand hyphae.

At the close of the growing season the only active mycelium is slightly in advance of the periphery of the root-rot spots, and it is at this point that new centers of infection usually occur the following year. The organism is believed to be not commonly spread by any aboveground agency, including the spores of the conidial stage. Because of the extremely erratic behavior of the fungus in the field, no correlation could be made with certainty with regard to environmental factors, the only one which seemed to have any influence being the amount of precipitation occurring during July, August, and September, and this appeared to be of little influence in the irrigated region.

II. *The pathological anatomy of Ozonium root rot*, G. L. Peltier and R. W. Samson.—Studies of material representing various stages of root rot on alfalfa and cotton roots, together with Ozonium strands on mesquite roots, are said to show that the strand hyphae are composed of a large central hypha around which are bands of smaller hyphae. The central hypha of the strands branches profusely to form a dense weft of large, irregular-shaped, thin-walled, manynucleated hyphae. Entrance to cotton roots is said to be effected by the hyphae of these wefts through the lenticels, through wounds of various kinds, and by direct penetration of the fungus between the cork cells. In the case of alfalfa, entrance can also be made through the small fibrous rootlets where they are attached to the taproot.

Entrance is effected by the formation of a hyphal wedge, which pushes its way between the cord and lenticel cells until the cork cambium is reached. The invading hyphae advance in all directions through the cork cambium and into the cortex. The hyphae are present in and between the cells, and in a short time enough of the parenchyma cells are broken down to form a depression in the bark. Many such depressions are found on the roots, and this is believed to indicate why the death of an alfalfa or cotton plant under optimum conditions for the disease is effected within a week.

Oospore-like bodies in cultures of Phytophthora infestans, H. R. Angell (*Quebec Soc. Protect. Plants Ann. Rpt., 17 (1924–25), pp. 79–81, figs. 2*).—Certain bodies found in material associated with the growth of *P. infestans* have been studied and described.

The preparation and effectiveness of basic copper sulphates for fungicidal purposes, E. B. Holland, C. O. Dunbar, and G. M. Gilligan (*Jour. Agr.*

Research [*U. S.*], *33* (*1926*), *No. 8*, *pp. 741–751*).—The authors describe a method for producing a basic copper sulfate that may be substituted either as a spray or powder for Bordeaux mixture. The preparation is described as a light, bulky powder, of good flow, free from grit, and adapted for use either as a spray or dust. The copper content is said to be similar to that of copper sulfate, and it is thought would be applied at the same concentration as Bordeaux mixture. Laboratory experiments with conidia of the apple scab fungus and field tests for the control of anthracnose and downy mildew of cucumbers and both early and late blight of celery showed that basic copper sulfate is an effective fungicide, easily applied, fairly indicative of the leaf surface covered, and of reasonable suspension, distribution, and adhesiveness.

Oat smut control experiments in 1923, B. T. Dickson (*Quebec Soc. Protect. Plants Ann. Rpt.*, *16* (*1923–24*), *pp. 77–79*).—A continuation, by the author, of work formerly recorded as done by him in connection with others (E. S. R., 50, p. 549) tabulates data so far as yet obtained in work, a further contribution to which is noted below.

Oat smut control in 1924, B. T. Dickson (Quebec Soc. *Protect. Plants Ann. Rpt.*, *17* (*1924–25*), *pp. 35, 36*).—Experimentation continued during 1924 at Macdonald College using Liberty oats and both smuts inoculated and handled as previously (see above) showed the best results from dust treatments as tabulated, the percentages of smut running for no treatment from 55.4 to 60, nickel hydrate from 1.7 to 2.5, nickel carbonate 1.66, nickel sulfide 0.8, and copper carbonate 2.1 per cent.

Studies concerning injury to seed oats after smut disinfection, W. L. Gordon (*Quebec Soc. Protect. Plants Ann. Rpt.*, *16* (*1923–24*), *pp. 79–94*, *pls. 4*).—An investigation to determine the factors responsible for injury as regards germinability to seed oats during or after disinfection and remedies therefor is set forth in detail and in tabular form with discussion.

The treatment phases considered included effect of varying strength (formalin solution), of duration, temperature, carbon dioxide, presoaking, soil moisture (limed and unlimed seed), dry storage (after treatment), and comparison of different smut treatments.

Work done on three hulled varieties and one hull-less variety of oats to determine the effects on germination of formalin, copper carbonate, and Uspulun showed that hulled oat seed can be effectively treated for smut with use of formalin without injury, even if the seed are stored (dry) for several months after such treatment. Different methods of formalin treatment for smut seriously injured Liberty oats, and this injury was increased by dry storage, temperature proving also to be a factor in producing such injury, which was, on the other hand, reduced by soaking before treatment with formalin.

The characteristic type of formalin disadvantage was retardation or killing of the radicle rather than plumule injury. Distinct reduction of formalin injury was obtained by dipping the seed in milk of lime after the formalin treatment.

Copper carbonate did not reduce germination in hulled oats or in Liberty oats, also such seed stored for several months retained its germinability.

Uspulun was harmless to hulled oats and appeared stimulating to Liberty oats, as regards germination. Storage for one month after this treatment did not reduce germinability.

A bacterial wilt and root rot of alfalfa caused by Aplanobacter insidiosum L. McC., F. R. Jones and L. McCulloch (*Jour. Agr. Research* [*U. S.*], *33* (*1926*), *No. 6*, *pp. 493–521*, *pls. 6*).—An account is given of a serious disease of alfalfa

which is said to occur in certain irrigated districts and the more humid areas of the United States where alfalfa is grown. The disease has been reported in various localities from New Jersey to Idaho and south to Mississippi.

The disease is said to be chiefly vascular in character, the bacteria passing from the taproot to each succeeding weakened crop of stems until the plant is killed. The most conspicuous symptom is a dwarfing of severely diseased plants and pale color of foliage, and small, narrow leaflets yellowed and curled at the margins. The taproot when cut shows yellow or brown discoloration beneath the bark. Artificial inoculation of alfalfa plants was accomplished only through wounds, introducing the parasite directly into the vascular system through cut stems, or into cortical tissue of roots whence it makes its way into the vessels. Symptoms of disease and the death of infected plants appeared to be hastened by retardation of root growth brought about by high soil temperature or frequent cutting of tops.

The parasite was also found to produce a wilt disease on sweet clover (*Melilotus alba*).

The cultural and morphological characters of the causal organism (*A. insidiosum*) are described and a technical description given of the organism by the second author.

Physiological specialization of Colletotrichum lindemuthianum in eastern Canada, K. A. HARRISON (*Quebec Soc. Protect. Plants Ann. Rpt., 17 (1924–25), pp. 45–62, pls. 2, figs. 2*).—A study is described as applied to bean pod spot, or anthracnose, a very serious bean disease, ranging as widely as Alaska, the Tropics, and Australia. This work was carried out largely along the lines of physiological study of the causal organism, *C. lindemuthianum*, in eastern Canada. A total of 21 cultures was used in a series of inoculation studies on 16 bean varieties, and results from 13 of these are given as limited each to one pure line strain.

The only variety found resistant to all the cultures used was Wells Red Kidney. Varieties proving resistant to all Canadian cultures were Navy, Minnesota 73, Davis White Wax, Yellow Six Weeks, Robust, and Fordhook Favorite.

A comparison of the infection results of the cultures isolated during the course of the work with their growth weights on mannitol showed that cultures grouped from slight differences in infection also gave different average weights. In an attempt to secure the perfect stage from any of the isolations by growing several cultures in one plate so that the colonies would run together, no sign of a perfect stage was found.

Preliminary report on a disease of common bean, K. A. HARRISON (*Quebec Soc. Protect. Plants Ann. Rpt., 17 (1924–25), pp. 62–69, pl. 1*).—An organism isolated from a bean pod from Annapolis County, Nova Scotia, apparently infected with *Colletotrichum lindemuthianum* is temporarily considered as being *Phyllosticta phaseolina* and distinct from the conidial stage of *Diaporthe phaseolorum* (*Phoma subcircinata*), primarily causing a pod spot of Lima beans. The organism seems to agree closely with the description given by Smith of *P. phaseolina* (E. S. R., 17, p. 47), but further work is needed.

Foreign clovers subject to disease (*Ohio Sta. Bimo. Bul., 11 (1926), No. 5, p. 207*).—Tests of red clover seed from various sources have shown that Canadian, Wisconsin, and Ohio strains have very little anthracnose, while some foreign strains have as high as 60 per cent infection. Italian clover is said to be particularly susceptible to the anthracnose fungus.

Cultural characteristics of certain Colletotrichum species, G. A. SCOTT (*Quebec Soc. Protect. Plants Ann. Rpt., 16 (1923–24), pp. 123–137, pls. 5,*

figs. 7).—This article, said to be an abridgment of a master's thesis at Macdonald College, deals with cultural and morphological characters of organisms found in association with certain potato diseases as cultured for comparative study.

In these experiments six organisms were used, all causing potato disease, but growing also on solid or liquid media. The results to date are detailed.

Potato degeneration diseases: Natural spread and effect upon yield, D. Folsom, E. S. Schultz, and R. Bonde (*Maine Sta. Bul. 331 (1926), pp. 57–112*).—In continuation of a previous publication on the importance and natural spread of potato degeneration diseases (E. S. R., 52, p. 246) a report is given of studies of samples of potatoes of the crop of 1923, grown in 1924 and in 1925, in which the increase of disease and the effect on yield are shown. Spindle tuber in Green Mountain and Irish Cobbler varieties reduced the yield rate of completely infected stocks to 20 per cent below the yield rate of healthy stocks of the same strains. Mild mosaic in similar comparisons in Green Mountain strains reduced the yield rate to from 8 to 15 per cent below that of healthy stocks. Rugose mosaic reduced the yield rate by 50 per cent. Mild mosaic was found to reduce the yield about the same in the third year of apparent infection as in the second. When the disease was present to the extent of 50 per cent or less the yield was not reduced in proportion to the reduction by a 100 per cent infection, and this did not reduce the yield rate more than uncontrolled differences in soil and other environmental conditions.

Tests made in 1925 of Green Mountain potatoes showed that spindle tuber reduced the yield rate of a completely infected stock to 25 per cent below the yield of a healthy stock. Mild mosaic reduced the yield rate to the same extent as spindle tuber, while rugose mosaic reduced the yield rate by about 60 per cent. Giant hill stock yielded slightly better than healthy. With spindle tuber or mosaic present in only part of the stock, the yield was reduced more than was proportional to the reduction in the completely diseased lots.

In a study of the amount and distance of spread of mosaic and spindle tuber from diseased to healthy fields, potatoes grown in 1924 showed that in 1923 one or both diseases had spread, in some places infecting a third of the plants in the first 5 healthy rows next to the diseased ones, while in some cases the disease spread across the field as far as the fiftieth row. A general increase of disease due to spread from one hill to another in partly diseased stock was found to be more frequent and probably greater in effect than the spread from one field to another. Therefore, the secondary effects of field-to-field spread may be worse than the immediate effects.

Although spindle tuber seemed to increase about as rapidly as mild mosaic when no tuber selection was attempted, it was found easier to reduce by roguing tuber unit seed plants than was mild mosaic. Some evidence was secured that is believed to indicate that other insects in addition to aphids are able to transmit these diseases, and that they probably do not transmit them similarly. Other degeneration diseases such as leaf roll and rugose mosaic are considered easier to eliminate than mild mosaic. Incompleteness of tuber infection was found to present a difficulty in attempting to rogue early, as it was often accompanied by a delayed appearance of symptoms. Contact between hills was found to increase the spread of the disease but was not necessary for its dissemination. Parts of a strain of potatoes may become different from each other through unequal contamination by disease.

Mosaic of rhubarb, B. T. Dickson (*Quebec Soc. Protect. Plants Ann. Rpt., 17 (1924–25), pp. 36, 37, fig. 1*).—In 1922–1925 observations were made on the appearance and spread of what is thought to be mosaic in rhubarb near

Montreal. Inoculation by rubbing or injection failed as did also attempts to transfer aphids.

Seed treatments for sweet-corn diseases, C. S. REDDY, J. R. HOLBERT, and A. T. ERWIN (*Jour. Agr. Research* [*U. S.*], *33* (*1926*), *No. 8, pp. 769–779, figs. 4*).—The results are reported of experiments in the treatment of sweet corn with several organic mercury compounds for the control of seed-borne diseases.

No practical control of bacterial blight was obtained by treating the seed. When nearly disease-free seed was used, the field stands and yields were affected but little by seed treatments with organic mercury compounds. When seed diseased with *Diplodia zeae* or *Gibberella saubinetii* was used, the field stands and yields nearly always were materially increased by seed treatments with the compounds. The yields from nearly disease-free seed were slightly higher than those from treated Diplodia-infected seed, and considerably higher than those from treated Gibberella-infected seed. The authors state that when only diseased seed is available for planting, certain treatments will have distinct value, and such treatments do not injure the seed.

Infection and temperature relations of black rot of sweet potatoes in storage, J. I. LAURITZEN (*Jour. Agr. Research* [*U. S.*], *33* (*1926*), *No. 7, pp. 663–676, figs. 4*).—A study was made of the method of infection, influence of temperature on infection, development of black rot of sweet potatoes, and on the growth of the causal organism (*Ceratostomella fimbriatum*).

Infection was found to occur through the normal skin of the sweet potato, but usually there was evidence of tissue disturbances at the point of infection in the form of raised areas, slight abrasions, and small rootlets. Wounding is not considered necessary in order for infection to occur, although evidence was obtained to indicate that wounding will aggravate infection and the development of the disease.

The fungus was found to grow in cultures over a range of temperatures extending from 9 to 36° C., and this range corresponds very closely with the limiting temperatures for infection. The optimum temperatures for infection and development of the disease are said to be from 23 to 27°. The temperature range for enlargement of the lesions was found to be from 6 to 33.5°.

The rate of enlargement of the lesions is said to be very slow at temperatures between 6 and 14°, and it is believed possible to practically eliminate the spread and development of black rot if sweet potatoes are stored at temperatures of from 10 to 12°, with a relative humidity below 90 per cent.

The relation of humidity to infection of the sweet potato by Rhizopus, J. I. LAURITZEN and L. L. HARTER (*Jour. Agr. Research* [*U. S.*], *33* (*1926*), *No. 6, pp. 527–539, figs. 2*).—The results are given of a study of the effects of air moisture on the infection of the sweet potato by *R. nigricans* and *R. tritici*.

Sweet potatoes of three varieties were cut in half and inoculated by dipping them in suspensions of spores of the fungi, after which the pieces were placed under controlled temperature and moisture conditions.

Evidence was obtained to show that infection of sweet potatoes by Rhizopus occurs almost exclusively through fresh wounds. The optimum relative humidities at a temperature of 23° C. for the infection were found to range from 75 to 84 per cent, the percentage of infection decreasing rapidly as the humidity was raised above or lowered below the optimum humidities. Very few infections occurred at relative humidities of from 93 to 99 per cent. Very few halved roots which had been subjected to relative humidities of from 89 to 97 per cent at a temperature of 23° for a period of from 4 to 12 days became infected when they were retained at these humidities for another period or were placed at humidities of from 48 to 89 per cent. On the other hand, a high

percentage of the halved roots which were subjected to relative humidities of from 51 to 73 per cent for a period of from 4 to 12 days became infected when they were placed later at relative humidities of from 84 to 95 per cent. Roots exposed to relative humidities of from 51 to 52 per cent for a period of from 9 to 12 days did not become infected when they were subsequently placed at relative humidities of from 48 to 73 per cent. A resistance to infection was developed in the roots that had been held at relative humidities of from 89 to 97 per cent. This resistance is said to be located in the surface layers of the wounded areas and has a possible relation to cork formation.

Apple spraying and dusting experiments in 1925, D. FOLSOM (*Maine Sta. Bul. 333 (1926), pp. 145–204, pls. 8*).—Studies were made of the spore discharge of the fungus in relation to infection by apple scab as bearing on time of spraying or dusting. Copper-lime dust, lime sulfur sprays with and without a spreader, and lime sulfur and sulfur dusts were compared for the control of scab and injury to fruit and foliage of the variety Ben Davis, the data being compared with those previously published (E. S. R., 54, p. 749).

Scab spots were found to appear early on the leaves of all plats, but the spread of the disease was checked by spraying. The spread of the fungus on trees representing the dusted plats was not significantly different from the spread in the control ones. As compared with the untreated control trees, those receiving copper lime dust showed more leaf spotting, apparently due to burning. Lime sulfur caused less burning than in 1924. In percentage of fruits affected, scab was significantly more abundant in one copper dusted plat, one plat sprayed 4 times, and two plats dusted 5 times with Pomodust than in three plats sprayed 5 times and one plat dusted 6 times with sulfur and sprayed once.

The most fruit russeting was associated with copper dusting, and the least was found in the controls. With more spraying there was more russeting, with no effect apparent from adding a casein spreader or from substituting dry for liquid lime sulfur. With more numerous applications of sulfur dust there was more russeting, but there was less injury than from the same number of applications of spray. The total yield of fruit was not appreciably affected by any fungicidal treatment, although there were some differences in the proportion of the better grades resulting from the amount of scab and russeting.

The author claims that the amount of scab on the fruit in any plat was determined by the current season's fungicidal schedule rather than by the amount of scab present on the fruit in the preceding year. The cost per tree of treatment is said to have been for 4 sprayings with liquid lime sulfur, 41 cts.; 4 sprayings with dry lime sulfur, 45 cts.; 5 sprayings with dry lime sulfur, 54 cts.; 4 sulfur dustings, 40 cts.; 6 sulfur dustings, 53 cts.; and 6 copper dustings, 54 cts.

From the small proportion of leaves found to contain mature ascospores, together with the time required for examination of the leaves, the author concludes that it is doubtful whether technical advice can be given that will permit a modification of spray schedules to fit seasonal and local variation in the time and severity of the first scab infection.

A study was made of the development of scab on fruit while in storage, and it was found that new spots may develop that at packing time were not detected or could only have been recognized by very careful examination. Temperature and humidity influenced the rapidity of development of the storage form of scab. The most important cause or difference in storage behavior was the source of the fruit, much less storage scab developing on fruit from sprayed trees than on fruit from unsprayed ones.

The brown-pocket heart rot of stone-fruit trees caused by Trametes subrosea Weir, S. M. Zeller (*Jour. Agr. Research [U. S.], 33 (1926), No. 7, pp. 687–693, figs. 2*).—The author reports that *T. subrosea* causes a brown-pocket heart rot of peach and prune trees in orchard districts from central California to British Columbia. A survey in prune orchards showed that 73 per cent of the heart rot was produced by *T. subrosea*, and it was demonstrated that the presence of this heart rot is related to large, unprotected pruning cuts. Preventive measures recommended are the proper pruning to facilitate healing, treating the wounds with an antiseptic dressing, and preferably the use of a system of pruning such that large cuts are unnecessary or are reduced to a minimum.

Progress report on red plant of strawberries, A. H. Lees and L. N. Staniland (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1924, pp. 66–69*).—Examinations by the present authors subsequent to the report by Ballard and Peren (E. S. R., 52, p. 748) showed that in the summer of 1924 the nematode *Aphelenchus fragariae* could be found in comparatively large numbers in strawberry plants which appeared to be normal. A number of such observations are detailed.

The relation of the nematodes to water was also studied. The facts set forth suggest a distribution of nematodes other than that hitherto accepted. For an explanation of the different manifestations of the disease, other factors must also be investigated. The authors still accept the presence of nematodes as a necessary hypothesis for the moment, but suggest that this alone is not sufficient.

The perfect stage of the fungus which causes melanose of citrus, F. A. Wolf (*Jour. Agr. Research [U. S.], 33 (1926), No. 7, pp. 621–625, figs. 2*).—The author reports that the perfect stage of the organism which causes melanose and stem-end rot of citrus has been found to occur upon decaying twigs of lime, grapefruit, sweet orange, and tangerine. Its connection with *Phomopsis citri* has been established by growth of both the pycnidial and ascogenous stages in culture from isolations from ascospores.

The ascigerous stage is said to belong to the genus Diaporthe, and the name *D. citri* is proposed for it. A technical description of the new combination is given.

Wintering over and infection of Puccinia malvacearum Mont., H. Hill (*Quebec Soc. Protect. Plants Ann. Rpt., 17 (1924–25), pp. 81–84*).—This paper presents a brief report of germination tests and inoculations made with the teliospores of *P. malvacearum* which had overwintered outdoors in Quebec on the stems and leaves of the hollyhocks, the purpose of this work being to determine the possibility of the organism overwintering as a teliospore and germinating the following spring so as to cause infection of healthy plants. It is stated that the immature teliospores can overwinter and infect healthy plants, though the percentage of these teliospores is so small that this can not be considered the chief means of spring infection in Quebec.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Report of the entomologist, J. R. Watson (*Florida Sta. Rpt. 1920, pp. 20–28*).—In this report on the work of the year ended June 30, 1920, the author considers the camphor and other thrips; the velvet bean caterpillar and the winter weather; nematodes and control by the use of calcium cyanamide, the sodium cyanide-ammonium sulfate treatment, sulfur, and the summer fallow and cultivated cowpeas and velvet beans; the whitefly-eating Delphastus; some other insects of the year; and the insects of pigeon peas.

[Entomological work at the Montana Station] (*Montana Sta. Rpt. 1925, pp. 26–28*).—In a discussion of the cause of the increase in numbers of grasshoppers some years, general observations have shown that temperature has considerable effect on their activity. When reared in cabinets kept at 70, 80, 90, and 100° F., it was found that the total amount of food required to carry the young grasshoppers from the egg to the adult stage was the same at all the temperatures, but the time required was 94 days at 70° and 25 days at 100°. The grasshoppers ate nearly four times as much in a day and grew nearly four times as fast at 100° as at 70°. The adult grasshopper was found to eat from 50 to 75 per cent more than the last nymphal stage, and at 100° they ate 2.5 times as much as when kept at 80°. At temperatures ranging from 80 to 100°, one adult grasshopper ate 1 mg. of dry food per hour and ate its own weight in green food every 15 to 18 hours. These figures indicate that it is not alone the number of grasshoppers but also the temperature conditions that determine the damage done to the crops by grasshoppers. Thus at Bozeman in 1918, from July 10 to October 1 there were 193 hours when the range of temperature was favorable to active feeding by the grasshoppers, whereas in 1919 there were 418 such favorable hours, and the food consumed by each grasshopper during the summer of 1919 was 2.2 times that consumed in 1918.

The study has also shown that with continued warm weather the grasshoppers lay more eggs, and that with favorable temperatures from 11 to 15 egg pods per season may be deposited. Confined in control cabinets kept at from 80 to 100°, the female grasshopper of one species was found to lay 1 egg mass every 80 hours, while, under field conditious when the air temperatures 4 ft. from the ground ranged from 70 to 90°, it was noted that no egg laying takes place below 70° and only in shaded ground when the air temperature is above 80°. Applying these facts to temperature conditions in the vicinity of Bozeman, in 1918, from July 10 to October 1 there were 264 hours when the air temperature at 4 ft. above the ground ranged between 70 and 90°, which made possible the laying of 3 egg masses, or 75 eggs, by each female, whereas in 1919 there were 640 hours of favorable temperature, making possible the laying of 8 egg masses, or 200 eggs, by each female. Thus 2⅔ times as many eggs could have been laid in 1919 as in 1918.

In investigations made in an effort to lower the cost of controlling insect pests, it was found in work with the fruit tree leaf roller that, by using calcium caseinate "spreader" instead of soap as an emulsifier, as effective results can be obtained with 4 per cent of oil in the spray as with 6 per cent and with no checking of the foliage in the spring. The study also showed that the stock emulsion can be made locally at a cost of about $2.50 for a 200-gal. tank of dilute spray mixture, whereas the best price on commercial oil emulsions would be $6 per tank. By thus lowering the cost while maintaining its efficiency, it is deemed probable that the oil spray will take the place of the lime sulfur now generally used to control oyster-shell scale and the blister mite, since it is both cheaper and easier to handle and equally as effective in the control of these orchard pests.

[Work in zoology and entomology at the Pennsylvania Station] (*Pennsylvania Sta. Bul. 204 (1926), pp. 35–38, fig. 1*).—In life history studies of the oriental fruit moth by S. W. Frost at Arendtsville, where four broods were reared, it was found that emergence commenced on May 5 in 1926, more than two weeks later than in the preceding year. In work with the bait pail, infestation under orchard conditions was reduced 50 per cent and infested fruit nearly 25 per cent. Best results were secured with a bait consisting of 1 part of molasses to 10 parts of water. A more detailed report of this method

of control has been made from another source (E. S. R., 55, p. 557). Reference is made to leaf-roller investigations by Frost. A bulletin relating to the red-banded leaf roller (*Eulia velutinana* Wlk.) has been noted (E. S. R., 54, p. 458), and one dealing with *Amorbia humerosana* Clem. is noted on page 156. *E. quadrifasciana* Fern. and *Pandermis limatata* were also under observation.

In control work with millepedes by C. A. Thomas, late fall treatments with granular calcium cyanide were applied to the soil in lettuce coldframes 12 days before planting the seed, and it was found that 400 lbs. per acre gave satisfactory control, whether drilled in with a seed drill or broadcast on the soil and thoroughly raked in. Treatment of a soil strip 2 ft. wide along the inside of the backboard gave as good control as did treatment of the whole bed.

Biological and control experiments were started by Thomas with the flies, springtails, and mites which affect cultivated mushrooms. A good control of the mites was obtained by the use of Kreso sheep dip, 1 part to 30 parts of water. However, this kills the mushrooms and retards the growth of the spawn and should be used only on beds where the mites are very abundant, to check their spreading. The flies can be held in check by dusting pyrethrum powder in the houses at the rate of about 2 lbs. to each 60-ft. house. Shallow pans filled with kerosene and placed just under electric lights in the house attracted and killed a large percentage of the flies. When the springtails gather in the aisles they can be killed by spraying them with kerosene, gasoline, or a nicotine solution. Fumigation of the houses when the manure is at its highest temperature (130 to 140° F.) will kill most of the insects and mites therein. Calcium cyanide has proved to be the very best fumigant tried thus far, but the best dosage has not been worked out.

In the early spring, when various species of wireworms that affect truck crops were beginning to move up toward the surface of the soil, excellent control was obtained by Thomas by first drilling in rows of corn 2 ft. apart and about two weeks later, when diggings showed about all the wireworms feeding on the corn, drilling in 150 lbs. of granular calcium cyanide per acre close to the rows and at least as deep as the grains of corn. In another two weeks the cyanide gas was out of the soil, and the regular crop was then planted. Another method, slightly less effective, was the broadcasting of the cyanide over the soil at the rate of 250 lbs. per acre in the late spring, when the wireworms have reached the upper 4 or 5 in. of soil, and plowing it under at once. Spring treatments are of considerably more value than treatment in the summer, when there is danger of burning the plants with cyanide, or in late fall after crop removal, when a large percentage of the wireworms are several inches below the plow line.

[Work in entomology at the Tennessee Station], S. Marcovitch (*Tennessee Sta. Rpt. 1925, pp. 15, 16*).—Reference is made to the use of fluosilicates as insecticides, accounts of which have been noted from other sources (E. S. R., 55, pp. 152, 157) and on page 157. It is pointed out that in tests conducted sodium fluosilicate has been fully as toxic to certain insects as arsenic, whereas against man the latter is 300 times as poisonous. The use of corn as a trap crop for the corn ear or boll worm on tomatoes did not give adequate protection, as previously noted from a more extended account (E. S. R., 55, p. 154).

Laboratory and field tests with the woolly aphid again showed paranitrochlorobenzene to be the most toxic material tested, amounts as small as ⅛ oz. being sufficient to rid 1-year-old trees of the woolly aphid underground. Due to various conditions, such as high temperature, the material evaporated too quickly and injured the trees. Further experiments with coal tar indicate that it is toxic enough to kill without any apparent injury to the trees.

Insecticide tests show that weevils can be readily killed with sodium fluosilicate, but further work is necessary to determine its actual value for the boll weevil.

An important outbreak of insects infesting soy beans in lower South Carolina, C. B. NICKELS (*Jour. Econ. Ent., 19 (1926), No. 4, pp. 614–618*).—This is a contribution from the South Carolina Experiment Station, reporting upon a severe outbreak of leaf-devouring caterpillars which occurred during the late summer and autumn of 1925 in fields of soy beans in the southern counties of the State. The lepidopterous species conspicuous in the outbreak included the velvet bean caterpillar (*Anticarsia gemmatilis* Hubn.), corn ear worm, fall army worm, bean leaf roller, and *Prodenia* sp.

Insect enemies of sugarcane in western Mexico, R. H. VAN ZWALUWENBURG (*Jour. Econ. Ent., 19 (1926), No. 4, pp. 664–669*).—In this contribution from the Hawaiian Sugar Planters' Station, the author reports that the major sugar cane pests in western Mexico are two moth borers, *Chilo loftini* Dyar and *Diatraea lineolata* Wlk. Neither is held in check by parasites, although the latter is fairly well parasitized by Trichogramma late in the summer and is of secondary importance after the first crop. *Leptodictya tabida* H. S. is everywhere common but is of slight economic importance. A noctuid larva, *Saccharaphagos mochisa* Schauss, is sometimes numerous in ratoon fields, where two species of Cirphis also occur. *Tomaspis posticata* Wlk. has lately become a pest of some importance.

Toxicity of dipyridyls and certain other organic compounds as contact insecticides, C. H. RICHARDSON and C. R. SMITH (*Jour. Agr. Research [U. S.], 33 (1926), No. 7, pp. 597–609, figs. 5*).—This paper reports on the chemical relationships of the dipyridyls, preliminary experiments on the toxicity of crude dipyridyl oil, methods of application of crude dipyridyl oil, insects used in the experiments, spraying experiments with aphids, submergence tests with other insects, effects of sprays on plants, insecticidal properties of the constituents of crude dipyridyl oil, and insecticidal properties of other compounds.

It is pointed out that a crude oil containing several isomeric dipyridyls and other substances has been prepared from pyridine and sodium, which was found to be highly toxic in spraying experiments with six species of aphids, though surpassed in this respect by nicotine. In submergence experiments the crude oil was more toxic than nicotine to the larvae of two species of Coleoptera and one species of Lepidoptera, and less toxic than nicotine to the adult of one species of Coleoptera and to silkworm larvae.

"Crude dipyridyl oil, in the present experiments, was not injurious to plants infested with aphids at concentrations sufficient to kill the aphids. $\alpha\alpha$, $\beta\beta$, $\beta\gamma$, and $\gamma\gamma$ dipyridyls, which occur in the crude dipyridyl oil used in these tests, were not so toxic to *Aphis rumicis* as the crude oil itself; $\gamma\gamma$ dipyridyl is much less toxic than the other three compounds. Several preparations from the crude oil proved to be highly toxic to *A. rumicis* on nasturtium plants. Although unquestionably impure, they approached closely the toxicity of nicotine for this aphid. Work is being continued on these preparations. The toxicities of 16 other organic compounds tested during this investigation are given also. Several of these are related to the dipyridyls or to nicotine. As compared with dipyridyl oil, they showed no appreciable toxicity. Crude dipyridyl oil was more toxic than nicotine to certain insects used in this investigation, and it is possible that it may also prove more effective for the practical control of some injurious insects."

The possibilities of sodium fluosilicate as a poison in grasshopper baits, G. S. LANGFORD (*Jour. Econ. Ent., 19 (1926), No. 4, p. 670*).—In an attempt to

determine the efficiency of sodium fluosilicate against the common injurious species of grasshoppers in Colorado, a 4-acre plat of freshly cut alfalfa was poisoned, and excellent results were obtained. A series of laboratory experiments were then undertaken, using mostly the red-legged grasshopper. Compared with other insecticides tested in the same way, the percentage of kill after six days was sodium fluosilicate 100 (4 days), Paris green 98.7, white arsenic 98.2, sodium arsenite 96.5, sodium fluoride 92, and control 30.3 per cent.

Preliminary report on sodium fluoride as a control for cattle lice, F. E. Guyton (*Jour. Econ. Ent., 19 (1926), No. 4, pp. 602, 603*).—In experiments conducted, sodium fluoride applied to the neck, shoulders, and rump of cattle by means of a small tin shaker and rubbed into the hair by the naked hand gave perfect control of three species of biting lice with no ill effects to the cattle. Five cattle treated with nicotine dust all showed infestation eight days after treatment.

Survival expectancies of two aphids, A. C. Baker (*Jour. Econ. Ent., 19 (1926), No. 4. pp. 648–650, fig. 1*).—The author presents a graph showing the survival expectancies of two common species, namely, the apple aphid and the "green bug" of the grain fields (*Toxoptera graminum* Rond.).

The spruce gall-aphid (Adelges abietis Kaltenbach), G. W. Herrick and T. Tanaka (*New York Cornell Sta. Bul. 454 (1926), pp. 17, figs. 6*).—The authors discuss the history, distribution, and injury, and the scientific and common names of *A. abietis*, describe the forms, and deal with the life history, parthenogenetic development, and control of this insect, which is a source of injury particularly in New York, Pennsylvania, and the New England States.

It is reported that in control work a 550-ft. hedge which had been abundantly infested with the aphid was thoroughly sprayed on both sides on April 9, 1924, with powdered lime sulfur at the rate of 16.5 lbs. to 50 gal. of water, with the result that not a single developing fresh gall was found throughout the season. On April 21, 1924, another hedge was sprayed with Sunoco oil at the rate of 1 part to 20 parts of warm water, and very satisfactory results were obtained from the readily emulsified oil. The thorough application of 1 qt. of Scalecide to 20 qt. of water on April 6 gave very satisfactory results, not a single new gall having been observed on the trees during the summer and fall. There was no evidence of any injury to the tree when applied during the spring of the year at this strength. The author considers the evidence obtained to indicate that this miscible oil is nearly a specific in destroying the spruce gall aphid.

An apparently new sugar-cane mealybug, H. Morrison (*Jour. Agr. Research [U. S.], 33 (1926), No. 8, pp. 757–759, fig. 1*).—Under the name *Ripersia radicicola* the author describes a new species of mealybug injurious to sugar cane in certain localities in Cuba through its attack upon the roots. It has also been taken on the roots of *Echinochloa colonum* at Baragua, Camaguey, Cuba.

The dusky leaf roller [Amorbia humerosana Clem.], S. W. Frost (*Pennsylvania Sta. Bul. 205 (1926), pp. 15, figs. 11*).—This is an account of a lepidopteran which has of recent years caused considerable injury to apples in Pennsylvania. It feeds upon a number of plants, but the apple seems to be the only host on which it inflicts serious injury. Records show it to be generally distributed throughout the eastern United States. The larvae roll the leaves and feed on both foliage and fruit, the deep cavities eaten in the fruit seriously affecting its quality. It has but one brood a year, and hibernates in the pupal stage. Three hymenopterous parasites, namely, *Epirhysalus atriceps* Ashm., *Glypta phoxopteridis* Weed, and *Glypta* n. sp., have been reared from the

larvae. Late summer and early fall applications of an arsenical poison seem to offer the best means of control.

The seasonal history and food habits of the tobacco budworm, Heliothis virescens Fab., in the southern tobacco-growing region, F. S. CHAMBERLIN and J. N. TENHET (*Jour. Econ. Ent., 19 (1926), No. 4, pp. 611–614, fig. 1*).—This is an account of the seasonal history and food habits of *H. virescens* in the southern tobacco-growing region. The pest is usually present from the first of April until the middle of October, during which period there are four broods. Tobacco and beggarweed are the food plants of major importance. Control measures have been reported in an earlier noted publication by Morgan and McDonough (E. S. R., 37, p. 663). *H. obsoleta* is said to be only rarely found on tobacco in the southern tobacco-growing region.

[Insecticide tests at the Kentucky Station] (*Kentucky Sta. Rpt. 1925, pt. 1, p. 15*).—Of various insecticides tested for control of the Mexican bean beetle, the best results were obtained from calcium arsenate 1 part and hydrated lime 9 parts, only 2.85 per cent of the plants being injured when finally examined.

Fluorides versus fluosilicates as insecticides, S. MARCOVITCH (*Science, 64 (1926), No. 1650, p. 159*).—Referring to an article by Roark, previously noted (E. S. R., 55, p. 658), it is maintained that the author's early investigation included the first scientifically planned experiment with the fluosilicates for the control of the Mexican bean beetle by dusting.

The squash beetle in Arizona, occurrence and probable manner of introduction, J. R. DOUGLASS (*Jour. Econ. Ent., 19 (1926), No. 4, pp. 632–635*).—During 1921 the squash beetle appeared in the vicinity of Douglas, Ariz., and slowly extended its range until 1924, when it covered about 65 square miles. During 1925 the insect was not found within the previously infested area, and it is believed that a deficiency in precipitation combined with an increase in the mean temperature, may have been responsible for the disappearance of the pest. The beetle differs from the northern or eastern form.

Metal barriers as protective devices against the saw-toothed grain beetle, J. C. HAMLIN and W. D. REED (*Jour. Econ. Ent., 19 (1926), No. 4, pp. 618–624, pl. 1*).—Laboratory experiments reported upon indicate that, under certain conditions, certain types of metal barriers may afford to raisins a high degree of protection from the saw-toothed grain beetle. A preliminary report has been noted (E. S. R., 54, p. 662).

The Acalypha flea beetle (Crepidodera atriventris Melsh.), W. V. BALDUF (*Jour. Econ. Ent., 19 (1926), No. 4, pp. 624–632*).—This flea beetle, which has long been known to eat wild Acalypha, recently did marked damage to ornamental species of the genus at the University of Illinois. The first three stages are spent in the ground about the plants, the larva feeding on the roots. Two generations are believed to develop each year at Urbana, Ill., the winter being passed in the adult stage. A small hymenopterous parasite was obtained from the adults.

The concentration of wireworms by baits before soil fumigation with calcium cyanide, R. E. CAMPBELL (*Jour. Econ. Ent., 19 (1926), No. 4, pp. 636–642*).—In this further report on the use of calcium cyanide (E. S. R., 52, p. 856), the author finds that applications of from 200 to 300 lbs. of the granular form to the acre with a grain drill under certain conditions will kill a high percentage of the wireworms, but that ordinarily this treatment is too expensive for commercial use. Therefore, advantage was taken of the fact that wireworms will collect in rows or hills of seeds, and several kinds of seeds were planted as baits to concentrate the wireworms in rows. It was found that by this method a fairly heavy dosage can be applied to the baited rows, and the

amount required to the acre will be considerably less than in broadcast treatment. Considering the lethal effect and the cost, from 5 to 5.5 lbs. per 1,000-ft. row was found to be the most satisfactory amount of calcium cyanide. The percentage of wireworms attracted to the baits decreased as the width of the rows increased, being 96 per cent for 2-ft. rows and 80 per cent for 4-ft. rows.

The clover root borer, L. P. Rockwood (*U. S. Dept. Agr. Bul. 1426 (1926), pp. 48, figs. 15*).—This is a report of studies of *Hylastinus obscurus*, which has been under observation for the last several years at the field station of the Cereal and Forage Insect Division of the Bureau of Entomology at Forest Grove, Oreg. In the course of the investigation many new data on the bionomics of the insect have been accumulated and are here presented in an attempt to correlate them with previously published records and with unpublished notes from the bureau files. The author deals with the synonymy, habits of related species, economic history, distribution, seasonal history, life history, sexual development, number of generations, rate of reproduction, ecology, damage, natural enemies, and control, and gives descriptions of the several stages in the life of the borer. A list of 50 references to the literature is included.

Recommendations regarding boll weevil work, J. E. Mills (*Abs. in Jour. Econ. Ent., 19 (1926), No. 4, pp. 601, 602*).—This is an abstract of recommendations presented at the annual convention of the Cotton States Entomologists, held at Atlanta, Ga., in February, 1926.

Cotton boll growth in relation to boll weevil injury, E. W. Dunnam (*Jour. Econ. Ent., 19 (1926), No. 4, pp. 589–593*).—While studying the boll weevil, the author found that as cotton bolls grow older they are less susceptible to injury. Of the varieties of cotton used, namely, Dixie Triumph, Webber 49, and Humco Cleveland, the first mentioned was the most and the last the least susceptible. There was no correlation between the number of feeding punctures or the number of egg punctures and the percentage of cotton loss; nor was there any relation between the thickness of hull and susceptibility to weevil damage, in spite of the fact that the weevils lay fewer eggs in the thick-hulled varieties. The determining factor appears to be the hardness of bolls, because varieties with the hardest bolls, as determined by the number of grams pressure required to puncture them, show also the smallest percentage of cotton loss.

The breeding of boll weevils from infested cotton squares, B. Gehauf (*Jour. Econ. Ent., 19 (1926), No. 4, pp. 593–599, figs. 2*).—This is a report on the rearing of boll weevils for use in toxicity work of the Chemical Warfare Service of the U. S. Army.

Comparative tests with sodium fluosilicate and calcium arsenate for the control of the cotton boll weevil (Anthonomus grandis), M. R. Osburn (*Jour. Econ. Ent., 19 (1926), No. 4, pp. 643, 644*).—In field and cage tests conducted at the Upper Coastal Plain Substation, Rocky Mount, N. C., sodium fluosilicate was more effective against the boll weevil than calcium arsenate, and reached its effectiveness in less than half the time. An average control of 80 per cent was attained in 24 hours, when maximum effect was reached, while 48 hours were necessary for a control of 69 per cent with calcium arsenate. Sodium fluosilicate appeared to act as a repellent as well as an insecticide.

Progress report of work of the Chemical Warfare Service on the boll weevil (Anthonomus grandis), H. W. Walker and J. E. Mills (*Abs. in Jour. Econ. Ent., 19 (1926), No. 4, pp. 600, 601*).—This is an abstract of a paper presented by the authors at the annual convention of the Cotton States Entomologists, held at Atlanta, Ga., in February, 1926. They report that preliminary tests were made of some 1,000 poisons or poisonous mixtures, in which a total

of over 100,000 weevils were used. About 50 of the materials showed a toxicity equal to or greater than calcium arsenate, and of these above 20 showed little or no injury to the cotton plant. Barium, lead, zinc, mercury, and to a less extent iron showed some measure of toxicity to the boll weevil when combined with other chemical groups in themselves harmless, and the toxicity of these metals seemed, in general, to be retained when combined with arsenic and to increase the toxicity of the resulting arsenical. Sodium fluosilicate, barium fluoride, and cryolite seemed to be equally as effective as calcium arsenate on a volume for volume basis. Every effort should be made to decrease the specific gravities of these compounds so as to give them the same covering power as the calcium arsenate. The authors believe that an advantage is gained in reducing the percentage of arsenic in calcium arsenate and using a larger amount per acre. It is pointed out that high concentrations of toxic gases are ineffective against the weevil, due to its apparent ability to suspend breathing more or less at will.

The "cloud drift" versus the regular method of dusting, W. E. Hinds (*Abs. in Jour. Econ. Ent., 19 (1926), No. 4, pp. 607, 608*).—This is an abstract of a paper, reporting upon a test made at the Louisiana Experiment Stations in 1925, which indicated that the cloud-drift method will be limited in usefulness by the narrow range of atmospheric conditions within which it can be applied, but that when these conditions do occur and the direction of the drift is across the rows, advantage may be taken of the cloud-drift method to save at least one-half the time required for making the application by the usual every-row treatment.

Water-carriers versus nectar-carriers, O. W. Park (*Jour. Econ. Ent., 19 (1926), No. 4, pp. 656–664, figs. 5*).—In this contribution from the Iowa Experiment Station, it is pointed out that water carriers may be distinguished from nectar carriers by gently pressing on the abdomen of the loaded bee while it is held fast on a sheet of filter paper. If the disgorged honey-sac contents is nectar a translucent spot will be produced on the filter paper, whereas, if it is only water no such spot will remain upon drying. No suitable chemical test was found. Individuals selected by means of this test showed that nectar carriers working on white sweet clover required on the average one-half to three-quarters of an hour to make a round trip, while water carriers, obtaining their loads within 50 yds. of the apiary, completed their round trips in five minutes on the average.

A brief history of the sticktight flea and the fowl tick in the United States, D. C. Parman (*Jour. Econ. Ent., 19 (1926), No. 4, pp. 644–648*).—The author discusses the probable origin and spread of these two pests, and presents a list of host animals for each species together with the most important biological data relating to each.

ANIMAL PRODUCTION

The mutual influence of the proportion of the several nutrients in feeds on their digestibility.—I, Crude fiber—the digestibility of rations containing varying amounts of alfalfa and paper pulp, H. W. Titus (*New Mexico Sta. Bul. 153 (1926), pp. 52, figs. 3*).—The complete results of the investigation of the effect of fiber on the digestibility of alfalfa hay previously noted (E. S. R., 55, p. 465) are presented.

Rations consisting of first cutting alfalfa hay, and alfalfa with a high-grade filter paper pulp known as Cellomass making up 15, 30, 45, and 60 per

cent of the ration were each fed to 5 steers in two 10-day digestion periods. The following table shows the average apparent digestibility of the different rations, excluding the results which appeared to be erroneous:

Apparent digestibility of rations containing various amounts of alfalfa and paper pulp

Ration	Ingredients		Coefficients of digestibility								
	Alfalfa	Cellomass	Dry matter	Organic matter	Total nitrogen	Protein	Nonprotein	Ether extract	Nitrogen-free extract	Crude fiber	Ash
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
1	100	0	59.72	60.86	71.97	70.71	78.00	34.27	72.91	41.76	50.41
2	85	15	61.85	62.97	68.12	67.22	72.59	28.68	71.81	54.67	50.83
3	70	30	66.12	67.62	64.19	62.41	71.57	26.59	71.26	66.62	47.97
4	55	45	67.84	69.66	53.55	54.61	48.38	13.70	69.83	71.88	40.96
5	40	60	69.20	70.98	38.40	41.98	21.56	7.21	68.31	74.43	34.92

A study of the effect of the Cellomass on the apparent digestibility of the constituents of the alfalfa indicated that Cellomass up to 45 per cent of the total ration had no significant effect on the apparent digestibility of the dry matter, organic matter, and nitrogen-free extract of the alfalfa. When Cellomass made up 60 per cent of the ration, the digestibility of the organic matter appeared to be depressed.

When over 30 per cent of the ration consisted of Cellomass the apparent digestibility of the ash was lowered. As the percentage of Cellomass was increased the digestibility of the ether extract of the alfalfa was rather uniformly depressed, though it is suggested that this may not have been directly caused by the Cellomass. The results with the crude fiber showed some irregularity, as did the total carbohydrates of the alfalfa. Increasing the percentage of Cellomass in the ration decreased the digestibility of the fiber at first, then increased it, and finally decreased it. The apparent digestibility of the total nitrogen of the alfalfa dropped from approximately 72 per cent to approximately 38.4 per cent as the amount of the fibrous substance was increased from 0 to 60 per cent, but when corrected for metabolic nitrogen the true digestibility appears not to have been very much affected. In general the apparent digestibility of the total nutrients increased as the nutritive ratio changed from 1:3.37 to 1:7.92 and decreased as the nutritive ratio became greater.

The apparent digestibility of the organic matter, crude fiber, and nitrogen-free extract of the mixed feeds was approximately the same as was calculated for these nutrients, but as the amount of fiber in the ration was increased the digestibility of the ash, ether extract, and crude protein of the mixed feeds became less than was calculated. The optimum nutritive ratio for digestibility of the several ingredients of the mixed feeds was found to be approximately 1:7.9.

The retention of nitrogen by the steers increased as the percentage of Cellomass was increased up to 45 per cent, but when greater than 45 per cent there was a decrease in the amount of nitrogen retained.

From the results of the investigation it is concluded that the substitution of up to 45 per cent of lignin-free cellulose for an equal weight of alfalfa in a ration consisting solely of alfalfa does not affect the apparent digestibility of the carbohydrate portion of the mixed feed to any marked degree. It very greatly decreases the apparent though not the true digestibility of the crude

protein of the mixed feed, and causes a greater retention of nitrogen from a given weight of feed, resulting in a mixed feed producing larger gains in live weight per unit of feed eaten.

The composition of the gains in weight and the utilization of food energy in growing rats, H. H. Mitchell and G. G. Carman (*Amer. Jour. Physiol., 76 (1926), No. 2, pp. 398–410*).—In studying the composition of the gains made by rats, the composition of the carcass (minus the contents of the intestinal tract) of individuals from the different litters selected from experiments previously noted (E. S. R., 55, p. 794) was compared with the analyses of the experimental animals at the conclusion of the feeding period. The results for the individual animals are tabulated, showing the sex, age, live and empty weights, and percentage composition and calculated amounts of dry matter, ether extract, ash, total nitrogen, and energy in the empty carcass and in the gains of each. The analyses of the check animals agreed fairly well except for ether extract and gross energy, which showed considerable variability in rats from different litters. The composition of the gains appeared to vary widely, even though the same ration was consumed and the rates of gain were similar. Individuals from the same litter showed wide differences. In one case 2 rats gained 156 and 158 gm. in the same time and with approximately the same food consumption, but the energy value per gram of gain of one was 3.04 calories and of the other 1.65 calories.

The percentage of the total metabolizable energy of the ration that was accounted for as used in basal heat production and as body increases is tabulated for each rat fed. The utilization of the energy by individuals within the same litter generally showed good agreement, though there was considerable variation between the litters. In general, from 60 to 75 per cent of the metabolizable energy was accounted for. The energy stored in the body constituted only from 6 to 10 per cent of the metabolizable energy consumed. In all the litters except one the females consistently stored the lowest percentages, indicating that the females' voluntary activity was greater than that of the males.

The specific dynamic effect of food in the growing rat appears to be small. Data from another experiment are presented to show that while on a maintenance ration this effect is probably inappreciable.

Growth and development with special reference to domestic animals.—II, A new method for measuring surface area and its utilization to determine the relation between growth in surface area and growth in weight and skeletal growth in dairy cattle, S. Brody and E. C. Elting (*Missouri Sta. Research Bul. 89 (1926), pp. 5–18, figs. 12*).—This bulletin presents essentially the same material as was previously published by the junior author (E. S. R., 55, p. 675) with the addition of data showing the relation between surface area and weight and linear dimensions. The formula $SA=CW^n$, in which SA is the surface area, W is weight or linear dimensions, and C and n are constants, was found to represent accurately the relation between area and weight when $n=0.56$; area and height at withers when $n=0.24$; area and heart girth when $n=1.6$; and area and length of body when $n=1.7$.

The influence of the environmental temperature on the heat production of cattle, E. B. Forbes, W. W. Braman, M. Kriss, et al. (*Jour. Agr. Research [U. S.], 33 (1926), No. 6, pp. 579–589*).—Since a review and recalculation of the energy metabolism work at the Pennsylvania Institute of Animal Nutrition indicated that a steer which had been sheared produced more heat as measured in the calorimeter at 13.5° C. than at 19.0° in 3 repetitions at these temperatures, an experiment was conducted with one shorn and one unshorn steer, both of which were fasting.

At temperatures of 13.68, 15.70, 18.26, and 22.06° the 24-hour heat production corrected to the standard day for the shorn steer was 8,243, 7,989, 7,519, and 6,806 calories, respectively. At temperatures of 15.54, 18.46, 21.51, and 14.16°, the 24-hour heat production of the steer carrying a full coat of hair was 6,322, 6,430, 6,453, and 6,180 calories, respectively. The results indicate that the 3 temperatures below 22.06° were below the critical temperatures for the shorn animal, while at least all those above 15.54° were above the critical temperature for the haired animal, though the data suggests that there may have been a slight expenditure of energy resulting from an effort to keep cool.

With both animals the relative amount of heat given off as latent heat of water vapor increased as the temperature rose, but was much more pronounced with the steer having the full coat of hair.

The average heat production of a fasting steer with its full winter coat was 18.01 calories per kilogram of live weight and 1,457 calories per square meter of body surface. The decrease of heat production per degree centigrade of rise in temperature below the critical was 36 calories per square meter of body surface, or approximately 2.5 per cent of the fasting katabolism.

The fasting katabolism of dry cows, E. B. Forbes, J. A. Fries, W. W. Braman, and M. Kriss (*Jour. Agr. Research [U. S.], 33 (1926), No. 6, pp. 591–595*).—Data are presented giving the heat production as determined in the calorimeter at the Pennsylvania Institute of Animal Nutrition of dry cows which were fasted for from 3 to 8.5 days. Other data presented include the total and empty live weights of the animals, surface area, heat production per unit of weight and per unit of body surface, latent heat of water vapor, and temperature of the chamber.

Although 4 of the 5 experiments were conducted with different individuals, and the heat production depends on both the basal metabolism and the normal activity in the stall, nevertheless the heat production per standard day per unit of body surface was relatively uniform.

Beef cattle on the ranch (*Montana Sta. Rpt. 1925, p. 49*).—Experiments conducted at the substation at Havre have indicated that such feeds as corn fodder, silage, and straw fed in combination would maintain breeding cows during the winter in as good condition as the more expensive ration of alfalfa hay and cottonseed cake. Cows maintained on the cheaper ration have also produced as many and as large calves. In these tests, which have been conducted over a number of years, cows 8 to 9 years old have produced calves which are heavier at weaning than have younger or older cows.

Steer feeding: Substituting a legume hay for corn silage toward the end of the feeding period, E. S. Good and L. J. Horlacher (*Kentucky Sta. Bul. 264 (1926), pp. 3–27*).—The results of the 3 years' experiments in which clover or alfalfa hay replaced the corn silage in the ration of fattening 2-year-old steers toward the end of the feeding period (E. S. R., 54, p. 359) are brought together and summarized. The combined results show that in cases where silage gives out before the steers are fat a legume hay may be substituted for the silage with satisfactory results, though steers receiving silage throughout the entire feeding period showed somewhat greater returns than when legume hay was substituted during the latter part of the feeding period. In two of the three experiments legume hay produced more rapid gains and slightly fatter animals which brought a higher selling price, but the relatively high price of hay resulted in smaller net returns.

Wintering steers with and without corn silage preparatory to finishing on grass without grain, E. S. Good (*Kentucky Sta. Bul. 267 (1926), pp. 73–93*).—The results are given of three tests of the ability of steers to gain on

blue grass pasture without grain after being wintered on grain and hay rations with and without corn silage, a brief account of which was previously noted (E. S. R., 39, p. 475).

In the two experiments in which 2-year-old feeders were used and sold for slaughter off pasture, those which received corn silage made 20 and 66 per cent larger gains, respectively, on grass the following summer than those which were wintered without silage. In the third experiment, in which yearlings were wintered and sold as feeders off pasture, the steers receiving silage made 20.4 per cent less gain on pasture than those not receiving silage.

In the first experiment the combined winter and summer gains were practically the same for both lots, but in the other two experiments the combined gains were 16.6 and 4.5 per cent greater for those receiving silage. The calculated costs of gain were greater on the rations not including silage in all lots. It proved more profitable to feed a heavy silage ration with little or no corn than to allow a heavy feed of corn and a minimum amount of silage for wintering.

Effect of winter rations on gains of calves marketed as 3-year-old steers, E. W. SHEETS and R. H. TUCKWILLER (*U. S. Dept. Agr. Bul. 1431 (1926), pp. 11, figs. 5*).—In continuing the studies of beef production problems in the Appalachian region in cooperation with the West Virginia Experiment Station (E. S. R., 51, p. 772), three lots of 30 calves each were kept from the time of weaning until marketing at 3 years of age. The rations during the first winter consisted of clover hay, corn silage, and wheat straw; cottonseed meal, corn silage, and wheat straw; and mixed hay and grain. At the end of the first year's pasturing season each of the 3 lots was again divided into 3 sublots and was wintered on rations of clover hay, corn silage, and wheat straw; cottonseed meal, corn silage, and wheat straw; and mixed hay, corn silage, and wheat straw. All were finished on cottonseed meal, corn silage, and wheat straw with grass.

The results showed that there were relatively small differences in the gains made by the steers in the 9 different lots, but all showed a pronounced loss in weight from about October 10, when frost occurred, until the cattle were placed in winter quarters. This loss of weight in the yearlings was not made up until the end of the following winter feeding period.

Baby-beef feeding and grazing experiment, M. JACOB (*Tennessee Sta. Rpt. 1925, p. 14*).—The results of this project, which was started in the fall of 1923 and completed in the summer of 1925, with 50 native (Tennessee) calves and 50 Texas calves, indicated that oat straw and corn stover when fed with corn silage and cottonseed meal to calves and yearlings were as satisfactory as alfalfa hay for producing gains and were much more economical. The alfalfa-fed cattle produced the largest gains during the winter, but those receiving oat straw and corn stover made the greatest gains during the summer.

An analysis of the results indicated that it is better to finish calves for baby beef the first summer after wintering than to carry them through the second winter and finish on grass.

[Experiments with sheep at the Kentucky Station] (*Kentucky Sta. Rpt. 1925, pt. 1, pp. 18, 19*).—The results of the following experiments are briefly reported:

Fattening spring lambs on pasture.—In a comparison of blue grass pasture and a mixture of oats and rape for fattening spring lambs, 22 spring lambs were divided into 2 lots. Both lots received a supplemental grain mixture of rolled oats, bran, and linseed oil meal. Both lots of lambs made average gains of 3.5 lbs. each in 28 days.

Comparison of gains in sheared and unsheared lambs.—In this comparison 13 sheared lambs made an average gain of 3.5 lbs. in 28 days, while 7 unsheared lambs made an average gain of 6 lbs. in the same period.

Fattening late native lambs.—In a feeding period from July 9 to August 18, 36 lambs drenched with copper sulfate for stomach worms made an average gain of 12.2 lbs., as compared with 7 lbs. as the average gain of an equal number of undrenched lambs.

Culling the flock to improve wool production (*Montana Sta. Rpt. 1925, pp. 16, 17*).—The correlations of the first, second, and third fleeces with the fourth fleece of range ewes have been calculated as 0.29±0.060, 0.69±0.023, and 0.82±0.014, respectively, which indicate that the first fleece is an unreliable indicator of the fourth fleece, but that the second and third fleeces furnish much more satisfactory indicators of a ewe's ability as a wool producer.

Crossbreeding Merino ewes and Dorset × Merino F_1 ewes with mutton rams, W. L. Henning (*Pennsylvania Sta. Bul. 204 (1926), p. 13, fig. 1*).—In a test of the desirability of purebred and grade Merino ewes when mated with a Dorset ram and Dorset × Merino F_1 ewes mated with a purebred Southdown ram for the production of hothouse lambs, it was found that the crossbred lambs were very suitable for this purpose from the standpoint of conformation, quick fattening, and desirable quality.

Pig feeding experiments, J. M. Scott (*Florida Sta. Rpt. 1920, pp. 13, 14*).—Four lots of 4 pigs, fed for 130 days on rations of ground corn only, ground corn and tankage 10:1 self-fed, ground corn and peanut meal without hulls 2:1, and ground corn and peanut meal 1:1, made average daily gains of 0.58, 1.35, 0.84, and 0.90 lbs., respectively. The carcasses were examined for hardness at the conclusion of the experiments, but the results were somewhat conflicting.

Similar results were obtained in another experiment in which 4 pigs were fed on corn and peanut meal with a little skim milk.

[Experiments with swine at the Kentucky Station] (*Kentucky Sta. Rpt 1925, pt. 1, p. 17*).—No advantage was apparent in the rate of gain of pigs receiving the worm treatment as compared with pigs receiving no such treatment. Creamery buttermilk produced more economical and more rapid gains than semisolid buttermilk or water as a supplement to a grain mixture. Semisolid buttermilk was not as effective as the worm capsule in expelling roundworms from pigs.

The results of another experiment indicated that mineral mixtures were desirable as supplements to corn alone or corn and soy beans hogged down. A bone meal mixture was found to produce more rapid and more economical gains than a phosphate mineral mixture. Salt likewise stimulated the rate of gain made by pigs hogging down corn as compared with lots receiving no supplement, but tankage was not benefited by the addition of salt and limestone, though a good mineral supplement was almost equal to tankage when fed to hogs hogging down corn.

[Swine feeding experiments at the Montana Station] (*Montana Sta. Rpt. 1925, pp. 18, 19*).—The results of two experiments are briefly reported.

Value of supplements in feeding swine.—The addition of various supplements to a basal ration of ground barley and alfalfa hay indicated that the basal ration was deficient in protein and vitamins and probably in calcium and phosphorus.

In another experiment bone meal added to the basal ration produced very satisfactory results, as the feeding of 1 lb. of this substance saved 17.25 lbs. of barley as calculated from the feed required to produce a unit of gain.

In another experiment hull-less barley fed with alfalfa hay seemed to be 20 per cent more valuable for the production of gains than hull barley.

An economical method of feeding pigs on alfalfa pasture.—Spring pigs fed a limited grain ration during the pasture season were found to require less grain to attain a weight of 200 lbs. than when fed a full grain ration on pasture, or when no grain was fed during the pasturing season. A limited amount of tankage during the finishing period increased the rate and economy of gain. The recommended grain ration to be fed with pasture was 1 to 1.5 lbs. per head daily.

[Experiments in swine feeding at the Pennsylvania Station], M. F. GRIMES (*Pennsylvania Sta. Bul. 204 (1926), pp. 13, 14, fig. 1*).—The results of the following experiments are briefly reported:

Forage crops for pigs.—In a comparison of rape, oats and peas, alfalfa, and Sudan grass, 1-acre plats supplemented with a 2.5 per cent ration of corn and tankage 10:1 provided sufficient feed for 20 pigs over a period of 78 days in the rape, alfalfa, and Sudan grass groups. Oats and peas, however, only lasted 57 days. The groups ranked in the following order in the rate and economy at which gains were produced: Rape, alfalfa, Sudan grass, and oats and peas. White pigs in all lots showed some sun scald except for those on alfalfa.

By-products for fattening swine.—In continuing the studies of bakery by-products (E. S. R., 52, p. 270), bread and mixed crackers were compared with rations of corn and tankage, and corn, tankage, and minerals, with rape pasture in all lots. The rate of gain in the different lots was very similar.

Fatening rations for swine (dry lot).—The results of this test, which is a duplicate of that previously noted (E. S. R., 54, p. 366) do not entirely agree with the previous trial as to the value of minerals. Barley and middlings produced gains at a higher cost than combinations of corn with tankage, fish meal, or pea-size oil cake.

Winter rations for brood sows.—Sows made satisfactory gains and were kept in good condition with no apparent difference in the strength or size of the pigs in the litters produced when fed on rations of ear corn and fish meal, ear corn and alfalfa hay; ear corn, fish meal, and wheat bran; and ear corn, fish meal, and ground oats.

The endogenous nitrogen of hens as affected by molting, C. W. ACKERSON, M. J. BLISH, and F. E. MUSSEHL (*Poultry Sci., 5 (1926), No. 4, pp. 153–161*).—This and the following papers give more detailed results of the incomplete experiments previously noted from the Nebraska Experiment Station (E. S. R., 54, p. 368). The methods and plan of the experiments dealing with the utilization of proteins were previously outlined (E. S. R., 50, p. 576).

Detailed data showing the body weight, daily nitrogen excreted, and other information are tabulated for each of the 60 experiments with 25 nonmolting birds, and for each of the 35 experiments with 26 molting birds. The average nitrogen excretion daily on the nitrogen-free diets is also tabulated for each group according to the month in which the experiment was conducted. The daily endogenous nitrogen produced was relatively uniform in the different individuals and throughout the different months of the year in both groups with few exceptions, but during molting the nitrogen excreted per unit of body weight was 60 per cent higher than for nonmolting birds. The average figures were 144 mg. for nonmolting birds and 219 mg. for molting birds per kilogram of body weight daily.

The effect of cystine on the endogenous metabolism of molting hens, C. W. ACKERSON and M. J. BLISH (*Poultry Sci., 5 (1926), No. 4, pp. 162–165*).—In studying the effect of cystine on the endogenous nitrogen of molting birds,

3 series of experiments were conducted, using 4 molting birds in each. Two of the birds received small amounts of cystine in addition to the nitrogen-free diet. In the 3 experiments the molting birds not receiving cystine excreted an average of 239 mg. of nitrogen per kilogram of body weight daily, while the nitrogen excretion was reduced to 137 mg. per kilogram of body weight by the feeding of small amounts of cystine, which supplied from 15 to 19 mg. of nitrogen daily. The loss of body weight was also less when cystine was fed. The cystine thus exerted a protein-sparing effect entirely out of proportion to its nitrogen content.

The utilization of the proteins of corn by hens, C. W. ACKERSON and M. J. BLISH (*Poultry Sci., 5 (1926), No. 5, pp. 226–232*).—The average utilization of the proteins of corn was 68 per cent when the ration consisted of whole yellow corn and sugar together with minerals and filter paper for bulk. This determination was obtained by averaging the results of 43 trials with 25 mature nonmolting hens. On making a proper correction for the increased endogenous nitrogen metabolism of 12 molting birds on this ration the calculated protein utilization was identical.

The antiscorbutic vitamin in poultry nutrition, S. M. HAUGE and C. W. CARRICK (*Poultry Sci., 5 (1926), No. 4, pp. 166–172, figs. 2*).—The results of experiments at the Indiana Experiment Station are presented, which show that as much as 20 cc. of egg white or 15 cc. of egg yolk daily would not cure or prevent the occurrence of scurvy in guinea pigs receiving diets otherwise deficient in the antiscorbutic vitamin. Chicks, however, grew normally on scorbutic rations, and the livers and kidneys of such chicks contained abundant supplies of the antiscorbutic substance. The authors interpret these results to indicate that the chick requires the antiscorbutic vitamin but that it is able to synthesize this vitamin within its own body.

Concerning the growth of chickens raised without grit, G. D. BUCKNER, J. H. MARTIN, and A. M. PETER (*Poultry Sci., 5 (1926), No. 5, pp. 203–208*).—Two lots of 10 chicks each were kept confined from May 2, 1925, to January 1, 1926, at the Kentucky Experiment Station, for making a study of the need of growing chicks for grit. The feeds of the two lots, which were similar, included buttermilk, a grain mixture, mash, green feed, and cod-liver oil. Sand at first and later gravel was supplied as grit to one lot. The biweekly weights of the individual chicks showed that there was no significant difference in the growth rate of the males and females in the two lots or in the egg production of the pullets.

Analyses of the droppings for ash and residue insoluble in hydrochloric acid showed that larger amounts of both were present in the droppings from the birds receiving grit. The nature of the hydrochloric acid-insoluble résidue showed that considerable sand was passing through the birds receiving it. Ash determinations of the contents of the gizzards at the conclusion of the experiment showed that there was a very small amount of ash present and nothing which could have served as a grinder in the gizzards of the birds which had received no sand. The gizzards of this lot were also slightly heavier than those of the other lot, indicating a possible enlargement to overcome the lack of grit for grinding. It thus seems that grit is not essential to the growth and egg production of White Leghorn chicks up to 8 months of age.

Does the growing chick require grit? R. M. BETHKE and D. C. KENNARD (*Poultry Sci., 5 (1926), No. 6, pp. 285–293*).—The results of 3 experiments are reported from the Ohio Experiment Station in which chicks were successfully raised for from 12 to 28 weeks without access to grit.

In the first experiment 2 lots of 18-day-old chicks, receiving coarse ground and fine ground feed, respectively, but without access to grit, averaged 346.6

and 395.3 gm. in weight at the end of the 12 weeks. Two comparative lots having free access to granite grit averaged 353.0 and 373.5 gm., respectively, at the same age. No abnormalities or nutritional disorders were observed aside from the fact that all birds showed a tendency toward constipation.

In a second experiment 2 lots of chicks were used for comparing liquid skim milk fed ad libitum with 15 per cent dried buttermilk added to the basal ration, but no grit was fed to either group. At the age of 12 weeks, up to which time growth had been particularly successful on the liquid skim milk ration, all birds from both lots were divided into 2 groups, one of which was allowed access to grit up to 23 weeks of age. It is reported that both lots made normal growth with no signs of digestive or nutritional disturbances, and that laying was started between the eighteenth and nineteenth week in each lot. At the conclusion of the experiment the birds were killed and the digestive tracts examined. No differences were apparent except that the gizzards of the grit-fed birds were from one-fourth to one-third filled with grit, while from 2 to 10 particles of hard granular material were present in the gizzards of the other birds.

In a third experiment 2 lots of chicks were fed on muslin cloth during the first 2 weeks and on 0.5 in. mesh hardware cloth up to 28 weeks of age. Grit was furnished to one lot but not to the other. A coarse ground mixture of yellow corn and whole wheat was fed during the greater part of this experiment. The rate of growth and mortality was similar in the 2 lots, and the pullets started laying in both lots between the nineteenth and twentieth weeks. No grit was found in the gizzards of cockerels killed at the end of the sixteenth week which had received no grit during the experiment, and there was no apparent variation in the thickness or firmness of the gizzard musculature.

From the results of these experiments the authors conclude that grit is of no benefit to the birds for grinding purposes, the natural craving being due to the chickens' desire for minerals. These results are in agreement with those of Buckner, Martin, and Peter noted above.

Grit requirements of the growing chick, R. M. BETHKE and D. C. KENNARD (*Ohio Sta. Bimo. Bul., 11 (1926), No. 5, pp. 188-193*).—This is another account of the experiment noted above.

The influence of certain feeds upon the production of spermatozoa by the domestic chicken, W. A. CRAFT, C. H. M'ELROY, and R. PENQUITE (*Poultry Sci., 5 (1926), No. 4, pp. 187-198*).—In experiments conducted at the Oklahoma Experiment Station, 18 White Leghorn males were given rations containing a basal mash plus supplements in different lots of cubed white corn, cubed yellow corn, cubed white corn plus sprouted oats, and cubed white corn plus 4 per cent of cod-liver oil mixed with the mash.

Semen was collected from the cloaca of females after copulation with these males and placed in physiological salt solution. The numbers of spermatozoa and the percentage of motile spermatozoa were recorded. In the 116 samples of semen collected the numbers of spermatozoa per cubic millimeter of semen ranged from 2,000 to 4,000,000, and the percentage of motile spermatozoa from 1 to 100 in the different individuals. The males receiving the most deficient rations produced fewer sperm, but differences in the sexual activity of individuals were not entirely associated with variations in the ration. The males which were more active sexually produced a larger percentage of weak and dead sperm.

The weights of the testicles of each bird are also given as determined at the conclusion of the experiment.

The relation of the date of sexual maturity to egg production, H. L. KEMPSTER (*Missouri Sta. Research Bul. 88 (1926), pp. 3-12, figs. 3*).—This is a

complete report of the studies previously noted (E. S. R., 54, p. 762), dealing with the relation between the date on which laying starts to the seasonal and annual egg production of 1,110 White Leghorns, trap nested over a period of 7 years. The distribution of the birds according to the season of production including calculations of the usual statistical constants are presented. A third degree parabola was calculated to show the relation between the date of laying the first egg and the number or value of the eggs produced during the year. The correlation coefficients calculated with the date of maturity were annual egg production -0.2853 ± 0.0198, winter egg production -0.3315 ± 0.0158, summer egg production -0.16239 ± 0.021, rate of laying -0.1255 ± 0.021, and date production ceased -0.10688 ± 0.021.

It is concluded that the optimum date of sexual maturity is approximately November 1, but in order that an optimum mean date of maturity be obtained it is necessary that a considerable number of the birds of a flock start laying as early as September.

The all-mash method of feeding for egg production, D. C. Kennard and R. M. Bethke (*Ohio Sta. Bimo. Bul., 11 (1926), No. 5, pp. 180–187, figs. 3*).—Directions for feeding layers by the all-mash method, including suggested rations.

Supplements that improve the ration for layers, D. C. Kennard and R. M. Bethke (*Ohio Sta. Bimo. Bul., 11 (1926), No. 5, pp. 194–197*).—A series of tests of the comparative value of various supplements to a ration of grains and meat scrap indicated that the basal ration was deficient in certain supplements, but was improved by allowing exposure to the sunlight or by furnishing green forage. Green legumes improved the hatchability of the eggs, whereas cod-liver oil did not, though the latter substance lowered mortality and increased egg production in one of the two experiments.

[Broiler production at the Pennsylvania Station], M. H. Brightman and P. H. Margolf (*Pennsylvania Sta. Bul. 204 (1926), pp. 34, 35, fig. 1*).—Data presented indicate that broilers can be fattened as satisfactorily under good average range conditions as by crate fattening and with less labor.

In another test of the feasibility of broiler production for the Easter trade it was indicated that in order to make winter broiler production profitable good hatches must be secured and brooder facilities must be adequate to prevent high mortality.

Turkey production, F. E. Mussehl (*Nebraska Sta. Circ. 34 (1926), pp. 19, figs. 7*).—Directions for turkey raising, including suggestions for the feeding, management, breeding, and control of diseases.

Fur rabbits for profit, E. B. Smith (*London: The City & South London Ptg. & Pub. Co., [1925], pp. [6]+46, pls. 11*).—Directions are given for the feeding, breeding, and management of fur rabbits, with suggestions on varieties, exhibiting, and the preparation of the pelts.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle at the Pennsylvania Station], S. I. Bechdel and H. E. Honeywell (*Pennsylvania Sta. Bul. 204 (1926), pp. 18–21, fig. 1*).—The results of the following experiments are briefly reported:

The vitamin B requirement of the calf.—In continuing this study (E. S. R., 54, p. 373), 11 animals have received a ration deficient in vitamin B until they have been on the experiment in some cases over 2 years. The calves have grown normally to maturity, conceived, and 5 have dropped strong, healthy calves. The evidence indicates that calves do not have a requirement for

vitamin B unless the substance is synthesized by bacteria and other microorganisms in the digestive tract. The ration as used proved inadequate for lactation. The heifers went off feed in from 1 to 3 weeks after freshening and became very weak and emaciated, but the exact cause of the trouble was not definitely determined.

Ground whole buckwheat as a substitute for corn meal in the ration.—Grain rations containing one-third ground whole buckwheat and one-third corn meal were compared by the double reversal method in 3 20-day periods, using 10 Holstein cows. The buckwheat mixture proved to be somewhat inferior to the corn-meal mixture for milk production, but it is concluded that ground whole buckwheat may be used to take the place of corn meal in the dairy ration without seriously affecting milk production.

Is the vitamin B potency of milk dependent on the presence of vitamin B in the ration of the cow?—Milk from the heifers which freshened on the vitamin B rations noted above was fed at the rate of 8, 10, 12, 16, and 20 cc. per day to rats receiving an otherwise vitamin B deficient ration in order to test the potency of such milk in this substance. Such milk was found as potent in vitamin B as milk from cows fed on the usual winter ration of silage, grain, and leguminous hay. This points toward the conclusion that ruminants have the ability to synthesize vitamins through bacterial action in the digestive tract.

Soybean hay and soybean silage, C. C. HAYDEN and A. E. PERKINS (*Ohio Sta. Bimo. Bul., 11 (1926), No. 5, pp. 178, 179, fig. 1*).—Soy bean hay fed with corn silage was compared with corn and soy bean silage for milk production by the double reversal method in an experiment running from November 28, 1923, to April 18, 1924. The results indicated practically no difference in the feed value of the soy bean hay and the silage, though the cows refused the coarse stems which constituted 13 per cent of the hay.

Sunflower silage for dairy cows (*Montana Sta. Rpt. 1925, p. 17*).—In a comparison of oat and pea silage with sunflower silage, 2 lots of 4 Jersey cows each were fed experimentally for 42 days. The results showed that 100 lbs. of dry matter of oat and pea silage, with hay and grain added, produced 273 lbs. of milk and 12.5 lbs. of butterfat, while an equal amount of dry matter from sunflower silage produced 402 lbs. of milk and 19.23 lbs. of fat. The sunflower silage is also more productive in the higher valleys.

The rôle of vitamin A in the nutrition of calves, I. R. JONES, C. H. ECKLES, and L. S. PALMER (*Jour. Dairy Sci., 9 (1926), No. 2, pp. 119–139, figs. 11*).—This paper reports studies of the vitamin A requirements of Holstein calves conducted at the Minnesota Experiment Station. Six experimental and three control animals, of which the dams' feeding during gestation was known, were used in the investigation. With some modifications the experimental animals were fed vitamin A deficient diets, beginning soon after birth, which were composed of oxidized whole milk or skim milk, and later skim milk powder, white corn, wheat straw, lemon juice, calcium carbonate, and calcium phosphate. The control animals received cod-liver oil as a source of vitamin A. The vitamin A deficiency of the individual feeds was checked in experiments with rats. The feeding, growth record, and condition of each calf are reported.

The combined results show that calves require vitamin A the same as other species of animals. Cod-liver oil in amounts of 20 cc. daily protected two calves from evidence of vitamin A deficiency, though the necessary amount might have been less. One calf receiving 40 per cent of wheat straw in the ration made normal growth, while another calf on the same ration but consuming less wheat straw showed symptoms of vitamin A deficiency, probably

due to differences in vitamin A storage at birth. Calves suffering from a deficiency of this vitamin in the ration improved almost immediately when cod-liver oil was administered.

The livers of calves receiving rations containing vitamin A were rich in this substance, but it was absent from the livers of calves receiving the deficient diets.

Calves raised on whole and skim milk plus a roughage containing vitamin A are not likely to suffer from a lack of this substance, but where cows receive mainly dry feed and calves are raised on milk substitutes such troubles may occur.

Genetics of breeding better dairy stock, J. W. GOWEN (*Jour. Dairy Sci., 9 (1926), No. 2, pp. 153–170, figs. 4*).—This is largely a discussion of the relation between the milk production and the butterfat percentage of the milk from related animals as obtained from other studies at the Maine Experiment Station of Holstein and Guernsey Advanced Registry records.

Increased producing ability in dairy cows due to test conditions, M. H. FOHRMAN (*Jour. Dairy Sci., 9 (1926), No. 2, pp. 215–218*).—A comparison of the effect of age on the butterfat production of Jersey and Guernsey cows as determined by initial and reentry records showed that the reentry records indicated greater increases than were to be attributed to age. The difference is considered as due to the development resulting from the first test, and amounted to 12.2 per cent of the reentry records for the Guernseys and 11 per cent for the Jerseys.

A quantitative form of expressing persistency of milk or fat secretion, C. W. TURNER (*Jour. Dairy Sci., 9 (1926), No. 2, pp. 203–214, fig. 1*).—In previous studies (E. S. R., 51, p. 379) it has been shown that the monthly milk and fat production of cows declines as a constant percentage of the preceding month's production after the maximum is reached and when not complicated by unusual conditions or pregnancy. Indexes for persistency of production were derived as the average monthly decline during a lactation period and as the ratio between the total production and the highest month's production. The latter approaches a maximum of 12 in yearly records, and a maximum of 10 in 305-day records. The ratios associated with various rates of decline in fat production are tabulated and charted. From these the annual production may be estimated from the decline during the first few months after the maximum of production by multiplying the equivalent ratio by the maximum month's production.

The variation in the relation between the maximum month's and total production is shown among 5,396 Guernsey cows in which the coefficient of correlation was 0.761±0.004.

Practical uses in the selection and breeding of dairy cattle of this quantitative index of persistency are pointed out.

The effect of environmental temperature on the percentage of fat in cow's milk, W. P. HAYS (*Jour. Dairy Sci., 9 (1926), No. 2, pp. 219–235*).—In studying the effect of temperature on the fat percentage of milk the percentage of fat of the milk of the Missouri Experiment Station herd was determined for 258 days and compared with the average daily temperature when the cows were in and out of doors. With decreases in the average temperature from 86.5 to 49.7° F. the fat percentage gradually increased from 3.171 to 3.505 per cent, but there was a decrease to 3.463 per cent at 40.1° which was unexplainable.

In another experiment two Jersey cows were kept at constant temperatures of approximately 30, 40, 50, 60, 70, 80, and 90° until the fat percentage of the milk became relatively constant. The periods varied in length from 4 to 8

days. In each of the tests the fat percentage was distinctly different on the first day. The average results of these tests are summarized in the following table:

The effect of control of temperature on fat percentage of milk

Trial	Period	Average temperature for entire trial	Average milk per day	Average fat content for entire trial	Trial	Period	Average temperature for entire trial	Average milk per day	Average fat content for entire trial
	Days	° *F.*	*Pounds*	*Per cent*		*Days*	° *F.*	*Pounds*	*Per cent*
1	8.0	92.7	20.8	5.388	4	5.0	52.3	21.3	5.646
6	4.0	80.0	21.6	5.227	3	6.5	39.9	20.2	6.099
2	6.0	72.5	20.5	5.149	7	5.0	27.0	18.4	6.012
5	4.0	60.9	21.0	5.424					

The physiology of temperature regulation in animals is discussed, and it is pointed out from these results that the lowest fat test occurs between 70 and 90°, while variations either way increase the fat percentage, probably due to increased metabolism. Between 70 and 30° the fat percentage increases approximately 0.2 per cent for each 10° reduction in temperature.

The Babcock test for fat in milk and cream, A. D. Burke (*Oklahoma Sta. Circ. 65 (1926), pp. 14, figs. 12*).—This includes directions for testing milk and cream for butterfat and the text of the Oklahoma law.

[Experiments with dairy products at the Pennsylvania Station], F. J. Doan, C. D. Dahle, W. J. Caulfield, H. B. Pierce, et al. (*Pennsylvania Sta. Bul. 204 (1926), pp. 21-25*).—The results of the following experiments are briefly reported:

Methods of processing chocolate milk and their effect on cocoa separation, cream separation, and general quality.—The preparation of chocolate milk from raw or pasteurized milk was unsatisfactory because of the unsightly cream layer and the presence of sediment. Homogenization prevented the formation of the cream layer, and when two valves were used at low pressure the smallest amount of sediment was deposited. The use of gelatin was of no benefit, but the plain condensed skim milk or fluid skim milk replacing all or a portion of the water used in the sirup was advantageous, since it increased the viscosity of the finished product.

Studies in "cream line" formation.—The temperature of pasteurization did not appear to affect the creaming ability unless it was higher than 212° F. Additions of solids-not-fat in the form of plain condensed skim milk or skim milk powder did not increase the creaming ability, while clarification of raw milk decreased creaming, and clarification of hot milk intensified the effect, though milk held at a low temperature for several hours and clarified at 85° F. showed an increase in the creaming ability. Mixing fresh raw cream and skim milk had only a slight but variable effect on the amount of cream rising, but the mixing of pasteurized skim milk with raw cream produced a considerable loss in creaming. Homogenization of the milk reduced the volume of cream at all pressures, but when the cream only was homogenized an enormous increase in the cream volume was observed.

Factors affecting time, temperature, and overrun in freezing ice cream.—In this study the addition of ingredients which lowered the freezing point increased the time of freezing and whipping. Those ingredients lowering the freezing point were serum solids, cane and corn sugar, and various flavors.

Overrun was obtained more quickly with brine at low temperatures than with brine at high temperatures.

One of the most important factors influencing overrun was the temperature of the mix when the brine was shut off. Aging from 4 to 24 hours did not affect the time required to produce a 100 per cent overrun, though aging improves the texture of finished ice cream, but those mixes aged for 4 hours only were very satisfactory.

Relation between "gold number" and other tests in selection of gelatin in ice cream manufacture.—Irregularities observed in the relation of the gold number to the jellying value of gelatins for ice cream making indicate that the knowledge of the gold number is of little use in denoting the merits of a gelatin for ice cream making.

Factors affecting the freezing point of ice cream.—The results of comparative tests in which corn sugar replaced cane sugar on a dry-weight basis or on an actual-weight basis indicated that the substitution of corn sugar for part or all of the cane sugar considerably lowered the freezing point. Flavors such as strawberries, orange-pineapple, and chocolate were found to lower the freezing point and increase the time of freezing before the brine was shut off, as well as the total time required to freeze the mix and obtain the desired overrun.

Some factors affecting the growth of certain strains of P. roqueforti blue mold, II, N. S. Golding (*Jour. Dairy Sci., 9 (1926), No. 2, pp. 236–242, figs. 2*).—The influence of salt on the rate of growth in milk and in standard media of four strains of *Penicillium roqueforti* has been investigated in continuing this series (E. S. R., 55, p. 873).

Salt was added to each type of media in amounts of 4, 8, 12, and 16 per cent. The relative ability of the different strains to grow in different concentrations of salt showed that salt concentrations as usually found in Roquefort cheese would retard the growth of these strains, but that the amount of salt in Wensleydale cheese would not be an inhibiting factor.

An algebraic method of proportioning ice cream mixes, W. V. Price (*Jour. Dairy Sci., 9 (1926), No. 2, pp. 243–250*).—An algebraic method of proportioning the ice cream mix for the production of a standard type of ice cream is described which has proved satisfactory at Cornell University. The amounts of materials other than milk to be used are first determined directly, and then the amounts of milk products are found by solving suitable equations.

VETERINARY MEDICINE

[Work in veterinary medicine at the Kentucky Station] (*Kentucky Sta. Rpt. 1925, pt. 1, pp. 16, 17*).—In work with sterility in mares it was found that by not breeding mares with genital infections, by the proper handling of mares with functional disturbances, and by the correct application of even the simplest forms of cleanliness during the breeding season the percentage of foals in a number of studs was raised from 50 and 60 per cent to 75 and 80 per cent.

Reporting on vaccination work, it is stated that, of the 1,786 mares vaccinated in 47 different herds in 1924, 15 aborted, but the *Bacterium abortivo equinus* was not incriminated as the causal agent, 2 of the abortions being caused by *Streptococcus genitalium*, 7 by bad feed, 1 mare aborted twins, and no cause could be assigned for the remaining 5 abortions. During the fall of 1925 the Streptococcus was found in the internal organs of 5 aborted fetuses, indicating that this organism is the cause of some abortions among mares. Vaccination work was also conducted with cows and sows.

[Work with livestock diseases at the Montana Station] (*Montana Sta. Rpt. 1925, pp. 31, 32*).—Tests made by the station have demonstrated that small doses of potassium iodide fed to pregnant animals will prevent goiter in the young. The expense of feeding the potassium iodide can be reduced approximately to 1 ct. per sheep per year by mixing 1 oz. with 100 lbs. of stock salt. This method was tried out with several large bands of sheep and proved most effective and economical for controlling goiter in newborn lambs, the lambs not only being free from goiter but better and stronger as a whole.

Experiments in 1921 with blackleg, which is increasing among the sheep of the State, indicated that 2.5 cc. of vaccine, which is one-half the standard dose of vaccine for cattle, was sufficient to protect sheep, but this dosage produced material depression and shock in the sheep for several hours after the vaccination. Several experiments conducted have shown that 2 cc. of aggressin is the smallest safe dose for sheep. The experiments showed that 12 days should elapse before the sheep are exposed in pens and corrals known to be infected. The apparent depression or shock from vaccination was found by close observation to be only temporary in character, having no bad effect on the sheep after from 18 to 24 hours.

[Annual reports of the chief veterinary officer of Kenya Colony for the years 1924 and 1925], A. G. DOHERTY (*Kenya Colony Dept. Agr. Ann. Rpts. 1924, pp. 48–62; 1925, pp. 43–67, pl. 1*).—The occurrence of and work with infectious diseases of livestock are reported for 1924 and 1925.

Report of the chief veterinary research officer, J. WALKER (*Kenya Colony Dept. Agr. Ann. Rpts. 1925, pp. 68–124, pls. 2*).—The research work of the year 1925 with infectious diseases of livestock is reported upon.

The precipitin reactions of extracts of various animal parasites, L. HEKTOEN (*Jour. Infect. Diseases, 39 (1926), No. 4, pp. 342–344*).—Experiments here reported indicate that the precipitin reactions of materials derived from animal parasites follow the general law of species-specificness. The only exception to this rule seems to be the reaction of extract of *Setaria equina*, which in its classification is far removed from the ascarids, with precipitin serum against Ascaris albumin.

The X-ray diagnosis of animal parasites (helminths) in man, J. F. BRAILSFORD (*Vet. Jour., 82 (1926), No. 615, pp. 451–466, figs. 9*).—It is pointed out that the possibility of X-ray diagnosis depends on the calcification of the parasites or their location in the body.

Growing plants as possible carriers of anthrax, H. MORRIS and H. K. RILEY (*Louisiana Stas. Bul. 196 (1926), pp. 4–16*).—This is a report of investigations, based upon a series of experiments started in 1924 with a view to obtaining definite information as to possible forage contamination with anthrax spores.

The results indicate that under laboratory conditions anthrax spores were carried from artificially inoculated soil by germinating and growing plants, including corn, oats, rice, and beans. A few tests showed that the spores were also carried from the soil by Bermuda grass and bull grass. The spores were carried from the soil on the surface of the plant and not in the plant tissue. Washing the plants with water for three consecutive days removed only a portion of the anthrax spores. The findings emphasize the importance of sanitation in the control of this disease, and especially the necessity for complete destruction of anthrax carcasses to prevent soil inoculation and subsequent spread of the disease through forage contamination.

Cultivation of Rickettsia-like microorganisms from the Rocky Mountain spotted fever tick, Dermacentor andersoni, H. NOGUCHI (*Jour. Expt. Med.*,

43 (1926), No. 4, pp. 515–532, pls. 4).—A systematic study made by the author of 74 ticks of the species *D. andersoni* (=*D. venustus* Banks), the infectivity or noninfectivity of which was determined by biting experiments, inoculation of emulsions, and specific immunity tests, showed the presence in some instances of several types of microorganisms morphologically resembling the inciting microorganisms of spotted fever. Descriptions are given of these organisms, of which *Bacillus rickettsiformis* n. sp. was most frequently isolated and *B. pseudoxerosis* n. sp. and *B. equidistans* n. sp. less commonly encountered. These organisms are nonpathogenic for the guinea pig, rabbit, and *Macacus rhesus*.

Undulant fever from Brucella abortus, C. M. CARPENTER and H. E. MERRIAM (*Jour. Amer. Med. Assoc., 87 (1926), No. 16, pp. 1269–1271, fig. 1*).—This is a detailed report of two cases of infection in students at Cornell University in 1925 due to *B. abortus*, previously referred to by Moore and Carpenter (E. S. R., 55, p. 575). Recent reports of infection in man with *B. abortus* by Keefer (E. S. R., 50, p. 684) and Evans (E. S. R., 54, p. 872) have been noted. L. J. Orpen is said to have described cases in Rhodesia.[1]

A study of the value of the living vaccine in the control of bovine infectious abortion, R. E. LUBBEHUSEN, C. P. FITCH, and W. L. BOYD (*Cornell Vet., 16 (1926), No. 3, pp. 166–185; also Minnesota Sta. Tech. Bul. 43 (1926), pp. 166–185*).—This is a report of experimental work projected during the summer of 1922 and of a detailed observation on the efficiency of the living vaccine under farm conditions and natural infection. An earlier report has been noted (E. S. R., 51, p. 783).

The work has led to the conclusion that although some degree of immunity toward *Bacterium abortum* Bang is induced by the use of the vaccine, it does not reduce the abortion rate to a desirable minimum and should never be used in other than badly infected herds. Individual susceptibility to *B. abortum* infection was found to be extremely variable. The use of the living vaccine did not increase the number of animals which eliminated *B. abortum*. Some animals eliminated *B. abortum* without showing serologic evidence of infection. The authors were unable to demonstrate that vaccination retards conception, nor that increased sterility is directly associated with the use of the living vaccine. Clinical data on vaccinated and control groups are given in four infolded tables that are appended.

An experimental study on the pathology of the black-leg, H. MORITA (*Jour. Japan. Soc. Vet. Sci., 5 (1926), No. 1, pp. 1–10; Jap. abs., pp. 7–10*).—This abstract of the author's original paper in Japanese[2] has been previously noted from another source (E. S. R., 55, p. 70).

A study of contagious pleuropneumonia in imported cattle [trans. title], S. ONO (*Jour. Japan. Soc. Vet. Sci., 4 (1925), No. 1, pp. 9–48, pls. 4; Eng. abs., pp. 45–48*).—It is pointed out that, while this disease is widespread in Asia, particularly in Russia and India, Japan was quite free from it until September, 1924, when three cases were discovered by the author at the Yokohama quarantine station among 42 head of cattle imported from Dairen, China. Pathological studies of the three cases are reported upon.

Further notes on contagious pleuropneumonia in imported cattle [trans. title], S. ONO (*Jour. Japan. Soc. Vet. Sci., 4 (1925), No. 3, pp. 245–258, pl. 1; Eng. abs., pp. 257, 258*).—The author reports that in May, 1925, eight months after the first occurrence of pleuropneumonia among cattle imported from China to Japan, as above noted, the disease again broke ont in the city of

[1] So. African Med. Rec., 22 (1924), p. 75.
[2] Japan. Jour. Expt. Med., 8 (1924), No. 10.

Osaka and rapidly spread to the five neighboring prefectures, 124 cows being found affected and 656 treated as exposed to infection. A brief account is given of cultural and inoculation studies of the organism.

Appearance of contagious pleuropneumonia in cattle in Japan [trans. title], (*Jour. Japan. Soc. Vet. Sci., 4 (1925), No. 3, pp. 329, 330*).—An account is given of the appearance of this disease in Japan in September, 1924, and May, 1925, as noted above. The work of eradication is briefly reported upon, and the belief is expressed that the disease will soon be stamped out.

Lameness in lambs, H. R. SEDDON (*Agr. Gaz. N. S. Wales, 37 (1926), No. 8, pp. 563–567*).—This is a review of the present knowledge of lameness in lambs.

New cases of contagious pustulous dermatitis of swine, H. FUTAMURA (*Jour. Japan. Soc. Vet. Sci., 5 (1926), No. 1, pp. 11–13; Jap. abs., p. 13*).—A pustulous skin disease long recognized as an epizootic disease among swine in Japan, severe outbreaks of which have occurred since 1917, has been found to be due to a streptococcus isolated from the pustules. It is thought that natural infection in swine is probably favored by injury of the epidermis caused by the bite of insects such as mosquitoes, flies, etc.

Contribution to the biological and serological study of B. abortus equi, S. FUJIMURA, T. TOYOSHIMA, and T. SUENAGA (*Jour. Japan. Soc. Vet. Sci., 5 (1926), No. 1, pp. 15–20; Jap. abs., pp. 19, 20*).—In investigations at the veterinary laboratory of the Ministry of Agriculture and Forestry, Nishigahara, Tokyo, it was found that *Bacillus abortus equi* can be separated from the various members of the paratyphoid-enteritidis group as a specific bacillus and is perhaps the only organism causing abortion in mares.

Ultraviolet radiation as a therapeutic agent in veterinary medicine, J. W. PATTON (*Jour. Amer. Vet. Med. Assoc., 69 (1926), No. 6, pp. 734–758, figs. 3*).—The author discusses the subject at length, much of the data being presented in tabular form, and reports upon experiments with dogs suffering from distemper and chorea, in which he used the mercury vapor quartz lamp.

From the results obtained he concludes that ultra-violet radiation apparently has no direct beneficial therapeutic value in the treatment of so-called distemper in dogs. It does not appear to prevent those suffering from the disease from later developing chorea. Chorea apparently is little benefited by radiation. The antigen-antibody phenomenon would appear to be slightly assisted by radiation. The hemoglobin content of the blood appears to be raised by radiation, as are also the cellular constituents, with the exception of the polymorphonuclear leucocytes, which show an actual decrease. The hair coat, at least in the heavier and long-hair breeds, appears to retard penetration of the rays to the skin of dogs.

Internal parasites in poultry, M. H. BRIGHTMAN (*Pennsylvania Sta. Bul. 204 (1926), pp. 33, 34*).—Reference is made to the treatment of poultry with many of the known anthelmintics, none of which were 100 per cent effective. It was found that in a fowl nearing maturity there was slight chance of complete recovery even though the parasites were removed. Preventive measures are recommended.

On the intermediate host of Fasciola hepatica in Japan, M. SHIRAI (*Tokyo Imp. Univ., Govt. Inst. Infect. Diseases Sci. Rpts., 4 (1925), pp. 441–446*).—The author reports that the miracidia of the liver fluke were found to fairly penetrate into *Lymnaea pervia*, which has not been known as the intermediate host in Japan, gradually grow in it, and in a period of from 45 to 70 days become mature cercariae. If rabbits and guinea pigs were fed with encysted cercariae developed in *L. pervia*, they were well infested, having the young worms in the liver and other organs. Regarding the migrating route of young worms, the

author confirms Ssinitzin's finding (E. S. R., 31, p. 758) that the young worm penetrate through the intestinal wall and come into the peritoneal cavity i order to get into the liver.

Cecal abligation in fowls, A. J. DURANT (*Vet. Med., 21 (1926), No. 8, pp. 392 395, figs. 2*).—In this contribution from the Missouri Experiment Station th author reports having found cecectomy in chickens and turkeys for the remova of the cecal habitat of coccidia and *Heterakis papillosa* to be a difficult an unsatisfactory operation. The difficulties encountered led to the developmen of a comparatively simple operation, merely that of tying off the cecal pouche at their junction with the main gut, leaving the ceca in place without an surgical disturbance to the mesenteric attachments and blood supply. Th author uses the term abligation to differentiate this operation from cecectomy The ligation ultimately effects a complete severance of the ceca from the mai gut, and the stumps produced by the ligature wounds heal over in most case so perfectly as to prevent any leakage from the functional gut or from th detached ceca.

The operation has been performed successfully on fowls varying in age fron chicks three weeks old to adult birds, both male and female. Birds mos suitable in size, however, are those that weigh from 20 to 30 oz. In the cas of turkeys five weeks old poults have been operated upon with good results The limits of size and age that will be safe for turkeys have not bee determined. The technique is described.

Poultry disease control, F. A. LAIRD (*Jour. Amer. Vet. Med. Assoc., 6 (1926), No. 6, pp. 717–723*).—In this account the author deals with sanitatio and hygiene, bacillary white diarrhea, and avian tuberculosis.

The relationship between the amount of electrical charge and the agglu tination capacity of bacteria, M. W. LISSE (*Pennsylvania Sta. Bul. 204 (1926) p. 6*).—Sufficient work is said to have been done by the author, in cooperatio with R. P. Tittsler, on the problem of measuring the rate of cataphoresis an the agglutination capacity of strains of *Salmonella pullora* bacteria which caus bacillary white diarrhea in chicks to show (1) that the methods being use are suitable and accurate, (2) that there are large differences in charge an agglutination capacity for the 24 strains studied, and (3) that a positive answe will probably be obtained. This means that strains carrying a slight charge and which, therefore, are already near the isoelectric point, are easily aggluti nated, whereas those carrying a high charge are agglutinated with difficulty.

Technical studies upon bacillary white diarrhea, R. P. TITTSLER (*Pennsyl vania Sta. Bul. 204 (1926), p. 26*).—Brief reference is made to studies of varia tions existing between strains of *Salmonella pullora*, 90 of which strains were used. It was found that the agglutinability is the most important variation as some strains were encountered which agglutinated so poorly that if used in the agglutination test for carriers of bacillary white diarrhea the test would be worthless. These variations existed when the medium was uniform. No correlation was found between the agglutinability and the length of time the strains were carried in stock on artificial media. Reference is made to the electrophoretic studies being made cooperatively, as noted above.

Fowl pest in geese [trans. title], H. MIESSNER and R. BERGE (*Deut. Tierärztl. Wchnschr., 34 (1926), No. 21, pp. 385–393, figs. 10; abs. in Trop. Vet. Bul., 14 (1926), No. 3, pp. 116, 117*).—This is a report of investigations of fowl pest which disease appeared in two shipments of geese from northern Italy. It resulted in the death of 81 of 210 geese in the first shipment and of 40 of 96 geese in the second shipment. Clinical and bacteriological studies are reported upon. Pigeons were infected by the virus from hens, geese, and pigeons. The

filtrability of the organism was established by inoculation experiments with the hen. In contact experiments negative results were obtained. A list of references to the literature is included.

AGRICULTURAL ENGINEERING

Research in agricultural engineering, 1925, R. W. TRULLINGER (*Agr. Engin., 7 (1926), Nos. 8, pp. 279–282; 9, pp. 312–317*).—A critical analysis of typical research in agricultural engineering during 1925 is presented, together with a brief review of the more important results, the purpose being to indicate the type of work which was done during the year, to show something of its scope, and to draw attention to important lines of inquiry requiring further consideration. The general subjects dealt with are machinery, structures, irrigation, drainage, power, sewage disposal and water supply, materials, land clearing, and soil erosion.

The conclusion is drawn that the character of the research in agricultural engineering is improving. A great deal of comparative experimenting and testing of a local nature is still going on, but the tendency is to recognize the importance of establishing the broadly applicable fundamental principles governing the performance of agricultural operations.

The engineer and the soil—an orientation for reclamation, R. W. TRULLINGER (*Agr. Engin., 7 (1926), No. 7, pp. 243–245*).—In a contribution from the U. S. D. A. Office of Experiment Stations a brief analysis is presented of the engineering features of soil moisture control which require fundamental study. A list of 99 references to literature bearing on the subject is included.

Relation of water to yield of crop (*Montana Sta. Rpt. 1925, pp. 19, 21*).—Data are briefly reported which showed that the largest number of irrigations and the maximum amount of water applied gave the largest acre yield of alfalfa, but the yields were in no way proportionate to the amount of water applied. The time of application of the water was also an important factor. The yield of wheat was found to have little relation to the amount of water applied.

Character of the groundwater resources of Arizona, C. N. CATLIN (*Arizona Sta. Bul. 114 (1926), pp. 173–293*).—Analyses of a large number of samples of the ground waters of Arizona are presented and discussed, with particular reference to their value for sanitary and irrigation purposes.

Surface water supply of Pacific slope basins in Washington and upper Columbia River basin, 1924 (*U. S. Geol. Survey, Water-Supply Paper 592 (1926), pp. V+178, pls. 3*).—This report, prepared in cooperation with the States of Washington, Montana, and Idaho, presents the results of measurements of flow made on streams in these basins during the year ended September 30, 1924.

Daily river stages at river gage stations on the principal rivers of the United States, H. C. FRANKENFIELD (*U. S. Dept. Agr., Weather Bur., Daily River Stages, 23 (1925), pp. II+279*).—This volume, containing the daily river stages for 1925, constitutes the twenty-third of a series of reports on the subject (E. S. R., 53, p. 788).

Public Roads, [October, 1926] (*U. S. Dept. Agr., Public Roads, 7 (1926), No. 8, pp. 153–176+[2], figs. 26*).—This number of this periodical contains the status of Federal-aid highway construction as of September 30, 1926, together with the following articles: Simplified Soil Tests for Subgrades and Their Physical Significance, by C. Terzaghi; Direct Production Costs of Broken Stone, by G. E. Ladd; Concrete Compared with Timber for Highway Bridge Floors, by O. L. Grover; and The Strength of Mortar and Concrete as Influenced by the Grading of the Sand, by T. C. Powers.

A preliminary experiment on the supporting strength of culvert pipes in an actual embankment, M. G. Spangler (*Iowa Engin. Expt. Sta. Bul. 76 (1926), pp. 31, figs. 23*).—The results are reported of a preliminary study conducted in cooperation with the U. S. D. A. Bureau of Public Roads to determine, for different kinds of culvert pipe, embankment materials, and field conditions, the ratios between the supporting strengths which culvert pipe can safely be counted upon to develop in actual use and the laboratory strengths of such pipes when tested by standard methods. Ten sections, each 23.5 in. long, of practically unreinforced 36-in. concrete culvert pipe with shields 3 in. thick were tested in an embankment which was built up gradually to a height of 10 ft. above the top of the pipe. The measurements of side pressures were made by the use of 6 earth pressure cells. Laboratory tests were also made of 5 similar pipes using 3-edge bearings.

The culvert pipes cracked under heights of embankment ranging from 4 to 8.5 ft. above the top of the culvert, but none of the pipes collapsed or deformed extensively under the loads imposed by an embankment 10 ft. high above the top of the culvert. The settlement of the rigid culvert pipes was many times greater than any lowering of their tops from shortening of their vertical diameters under the loads. The ratio of actual supporting strength to 3-edge bearing laboratory test strength was approximately 2.6 at first crack in this experiment. Without the help of the active side pressure the ratio would have been about 1.9. The side pressure varied widely, showing a range equal to 158 per cent of the smallest result. However, the results confirmed the conclusion previously reached by the station that the active horizontal pressure in a mass of granular materials can be computed with fair accuracy by Rankine's formula for horizontal earth pressures.

These results alone are considered inadequate to warrant the drawing of general conclusions as to the safe ratio between the field supporting strengths and the laboratory test strengths of culvert pipe.

Laboratory investigations of the influence of curing conditions and various admixtures on the life of concrete stored in sulfate solutions as indicated by physical changes, D. G. Miller (*Amer. Soc. Testing Materials Proc., 24 (1924), pt. 2, pp. 847–861, figs. 8*).—Studies conducted by the University of Minnesota in cooperation with the U. S. Department of Agriculture and the Minnesota Department of Drainage and Waters are reported (E. S. R., 55, p. 880).

The results indicate that concrete, regardless of how well cured in water, must subsequently be allowed to dry thoroughly and harden before being exposed to the action of sulfate bearing waters if great resistance to attack is to be expected. Since no evident physical deterioration had taken place in one year in concrete cylinders cured in water vapor at or near the normal boiling temperature for water, the resistance of concrete so cured to sulfate bearing waters is deemed markedly greater than that of water cured cylinders.

The addition of powdered blast furnace slag to concrete up to 40 per cent of the weight of the concrete apparently had little or no influence on the strength and absorption, although the resistance to sulfate waters was increased to a degree closely proportional to the quantity of slag added. Ironite added to concrete up to 10 per cent of the weight of the cement had but slight influence on the strength and absorption, although the life in the sulfate solutions increased with the amount of ironite added. The life of specimens in sulfate solutions was also increased about 20 per cent by adding 4 per cent of calcium chloride or 4 per cent of Cal.

The use of a siliceous material in the form of volcanic ash as an admixture increased the life of specimens nearly 70 per cent when as much as 20 per

cent by weight of the cement was added. The results were negative for amounts less than 20 per cent, and the resulting loss in strength was about 30 per cent, so that it is considered probable that the utility of this material as a means of developing resistance to sulfates is very limited.

Both high calcium and high magnesium hydrated lime gave negative results on the life of concrete in sulfate solutions when used in proportions of 5 and 10 per cent. Alkagel A in the proportions of 1.5 and 3 per cent also gave negative results, as did water-gas tar in the proportion of 5 per cent.

Twenty per cent of water-gas tar caused more than 50 per cent of loss in the strength of concrete cylinders. Although the life of the specimens in the sulfate waters was about 50 per cent above that of normal cylinders, due to the water repellent qualities, the results are taken to indicate that the use of water-gas tar is not feasible.

Research in mechanical farm equipment, J. B. Davidson (*U. S. Dept. Agr., Bur. Pub. Roads, 1926, pp.* [*2*]+*93*).—This report is discussed editorially on page 101.

The development of the disk plow, R. C. Ingersoll (*Agr. Engin.,* 7 (*1926*), *No. 5, pp. 172–175, figs. 3*).—A brief history of the development of the disk plow is presented, together with some data on factors involved in design.

Control of the corn borer by machinery, C. O. Reed (*Agr. Engin.,* 7 (*1926*), *No. 9, pp. 305–308, figs. 7*).—The preliminary results of studies conducted at the Ohio State University on the control of the corn borer by machinery are briefly reported, and 11 methods which are to be tried out are outlined.

It has been found that in areas where it has been the practice to leave cornstalks standing the corn borer can be effectively controlled by machinery which simply combines machine elements now used in independent operations, without a material increase in cost of harvesting over present methods. Although some of the proposed 2-row harvesters compare very favorably in cost of operation with the 1-row outfits, their higher initial cost has been found to handicap their introduction. While the cutter head or combination cutting and shredding head type of machine seemed to have a slight advantage, the number of experiments was too small to permit the drawing of conclusions.

After the stalks are cut close to the ground and removed from the field, practically all of the larvae therein must be destroyed. Such stalks may be fed whole and the residue carefully segregated and burned in the spring prior to the emergence of the larvae. It has been found more practical and effective, however, to shred the stalks, leaves, and husks prior to feeding.

Preliminary data from incomplete experiments with both the cutting and shredding types of husker-shredder indicate that the borer mortality computed early in the following spring ranges from 95 to 100 per cent. Notwithstanding the fact that extremely high pressures were employed, the destruction of borers by crushing stalks between two large corrugated rollers was not nearly complete enough. Plowing under of crop residues was also unsuccessful, since many borers were found to crawl to the surface when buried a foot deep.

The conclusion is drawn that if any trash appears, even after weathering or harrowing, plowing under is a failure as a control measure.

A new machine to combat the grape leaf hopper, J. P. Fairbank (*Agr. Engin.,* 7 (*1926*), *No. 7, p. 240, figs. 4*).—A machine is briefly described and illustrated which blows calcium cyanide dust in and through four nozzles placed to direct the dust upward, downward, and sidewise. The dust is carried by air blasts through flexible metal tubes which come from a standard make of dusting machine. The whole outfit is carried on framework built upon a tractor which carries the assembly and drives the duster. Two tents are

carried by the framework, each astride a vine row. The tents are 18 ft. long and arranged with flaps at either end, which closely surround the vines. The tractor travels at a rate such that each vine is under the fume-filled tent for about 8 seconds.

Preliminary report of an investigation into the artificial drying of crops in the stack (*Oxford Univ., Inst. Agr. Engin. Bul. 2 (1926), pp. 104, pls. 8, figs. 32*).—Studies conducted by the Institute of Agricultural Engineering of the University of Oxford, England, are reported.

In the first series of experiments air at atmospheric temperature was successfully used for the drying in the stack of peas, beans, and cereals, but it is considered highly questionable whether any dependence can be placed on the method, since under adverse weather conditions the results have been a failure. In cold, damp weather or under conditions where the natural heat of a stack was low the method proved totally inadequate.

The second series of experiments dealt with the use of heated air. The average air temperature was 67° F. at 85 per cent relative humidity, and the temperature of the heated air at the duct was 97°. The volume of air used was 2,800 cu. ft. per minute. The number of stacks dried successfully demonstrated the practicability of the system. During the course of the experiments the volume of air supply was increased to 5,000 cu. ft. per minute.

A third series of experiments showed that, when there was sufficient heat and the volume of air was so regulated as to obtain the necessary heat reaction inside the material, the drying was successful.

Laboratory studies on the development of the drying apparatus showed that with cylindrical and conical center chambers the slope of the center chamber did not influence the formation of eddy currents if the blast of air was previously allowed to spread gradually in the duct without losing its stream line motion, and provided the velocity of the air was low. The penetrability of a stack was found to vary according to its height. With an equal thickness of stack around a cylindrical center chamber the penetrability at the bottom was less than at any point higher up. The design of the center chamber was found to be influenced by the fact that the action of rapid drying caused a stack to consolidate quickly and decrease in height within a few hours. It was therefore necessary to design the center chamber so as to insure equal distribution of the air after consolidation had taken place.

With the sloping trench opposite the duct outlet there was a considerable amount of turbulence inside the center chamber. When the sharp angles of the trench were rounded off a satisfactory distribution was obtained. Within certain limits an increase in the velocity of the air delivery appeared to have little effect on turbulence.

During the drying of sugar beet cossettes the resistance gradually decreased as the moisture content was reduced, and the dried material had a resistance approximately equal to 25 per cent of that of the original wet material. The shrinkage during drying was approximately 50 per cent. Wet and dried cossettes obeyed the same laws with regard to air velocity and thickness of material.

Experiments on the porosity of hay showed that to avoid undue resistance to the passage of air the average velocity of the air through the material must not exceed 20 ft. per minute. This fact definitely fixes the size of the center chamber for a given mass of hay.

It was further found that a temperature of 150° with any quantity of moisture present will effectively kill germination in seeds, and that a temperature of 140° in the presence of moisture will greatly reduce germination, ren-

dering the grain unfit for malting purposes. However, when a temperature of 120° is reached in a moist state there is an increased speed of germination and a more uniform sample is produced. Heating in a dry state appeared to cause little actual damage to the seeds, aside from a slight retardation of germination. It was found that in practice if the duct temperature is 160° the cooling effect due to evaporation considerably reduces the air temperature, and not until the material has a reduced moisture content does the stack temperature approach that of the ingoing air. Therefore a duct temperature of 140° is considered to be perfectly safe for crops grown for seed.

Several appendixes relating to supplementary experiments and to the mechanical details of the apparatus used are included.

Grain storage, drying, and shrinkage problems, E. W. LEHMANN (*Agr. Engin., 7 (1926), No. 8, pp. 269, 270, fig. 1*).—The results of studies conducted at the Illinois Experiment Station are briefly reported, from which the conclusion is drawn that for quick drying and a minimum loss of grain forced heated air is the most effective. Very good results may also be secured with a well designed crib and good natural ventilation, provided by an aerator and some sort of ventilating ducts to draw the air through the corn.

Results from artificial lighting of laying houses, G. W. KABLE (*Agr. Engin., 7 (1926), No. 9, p. 304, fig. 1*).—The results of studies conducted at the Oregon Experiment Station are reported graphically. The conclusion is drawn that lighting intelligently applied has the effect of smoothing out the egg production curve, transferring enough eggs from the low-price seasons to those of high price to pay all costs and yield a good profit.

An economical fire-heated hotbed, J. C. C. PRICE (*Mississippi Sta. Circ. 65 (1926), pp. 7, figs. 5*).—A flue-heated hotbed is described, and working drawings are presented.

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in agricultural economics at the Kentucky Station] (*Kentucky Sta. Rpt. 1925, pt. 1, pp. 6–12*).—A number of projects are reported upon.

Costs, returns, and profits for tobacco.—The study, covering 6 years in the Burley region and 5 years in the dark tobacco region, gave the following data, respectively, for the farms studied in the 2 sections: Acres of tobacco per farm 7.7 and 9.4, yield per acre 1,064 and 794 lbs., man labor per acre 330.4 and 252 hours, and horse labor per acre 97.6 and 84.3 hours. Tables are given showing for each kind of tobacco the percentage each cost item was of the total cost and the percentage of the total man labor hours expended in different operations. Man labor, horse work, barn and sticks, and use of land constituted 38.27, 7.14, 11.87, and 36.66 per cent, respectively, of the total cost of producing Burley tobacco; and 49.21, 13.02, 8.49, and 15.88 per cent, respectively, in the case of dark fire-cured tobacco. Of the man labor 35.45, 17.69, and 12.82 per cent, respectively, were required for stripping, cutting and housing, and worming, topping, suckering, and spraying in the case of Burley tobacco; and 22.48, 11.10, and 21.48 per cent, respectively, for dark fire-cured tobacco. Curing of the dark fire-cured tobacco required 9.66 per cent of the man labor.

Effect of yield on cost of producing wheat.—Data gathered from 19 farms in the Purchase region show the average yield of wheat and the cost of production per bushel to be 14.8 bu. and $1.22, respectively. The average yield and cost per bushel on the 5 farms having the highest yields and the 5 having the lowest yields were 23.2 bu. and 92 cts., and 8 bu. and $1.93, respectively.

Complete farm cost studies in Christian County.—The results of a three years' study show a wide variation on the different farms in the various items

of cost of producing an acre or a given quantity of product. The time at which, and the efficiency with which, the different operations were performed were found to be largely responsible for the differences both in the amount of labor used and the quality of the crop.

Business analysis of farms in Union and Henderson Counties.—A study of 270 farms shows the chief factors affecting farm profits to be efficiency of labor utilization, ratio of expenses and cost of production to receipts from farm sales, volume of sales, crop yields, and the ratio of returns from livestock to the value of feed fed.

Poultry and egg marketing.—The results of this study show that the outstanding problem is quality improvement, involving production, handling, and marketing; that satisfactory results in such improvement will not be possible until producers are paid on a definite grade basis; that the problem of distribution is one of getting the products into larger consuming centers; and that the price of Kentucky eggs averages higher than that for Tennessee and Missouri eggs, but lower than that for Indiana and Ohio eggs.

Tobacco marketing.—The study of the data on the production and stocks of tobacco indicate that the consumption of Burley tobacco in recent years has been slightly below 250,000,000 lbs. annually, while the production in 1922, 1923, and 1924 was considerably in excess of that amount. The production and consumption of dark tobacco in western Kentucky have been more nearly equal.

Statistical studies.—These studies show that the long-time trend of land in Kentucky farms has been upward, that the proportion of rural population in the State is higher than in the country as a whole, that the trend has been and is toward smaller farms, and that tobacco has been growing in importance.

[Investigations in agricultural economics at the Montana Station] (*Montana Sta. Rpt. 1925, pp. 15, 16*).—Eighty-nine irrigated farms in the vicinity of Billings having sugar beet yields of from 10 to 14 tons per acre returned 12.2 per cent on the investment, as compared with 4.1 per cent for 52 farms with yields of from 7 to 10 tons. The study indicates that sugar beets and winter feeding should be the basic sources of farm income for this section.

[Rural economics investigations at the Ohio Station] (*Ohio Sta. Bimo. Bul., 11 (1926), No. 5, pp. 198-207*).—The results of work in rural economics are given.

Ohio farm expenses, J. I. Falconer.—A table is given showing the index number (1909–1913=100) for labor, machinery, feed, taxes, fertilizer, building, clothing, furniture, groceries, fuel, and miscellaneous, and the weighted index for the total expenditures for April of 1923, 1924, 1925, and 1926, together with the weight assigned each item in computing the weighted index. The weighted indexes for the four years were 164, 162, 168, and 161, respectively.

Freight rates on Ohio livestock, G. F. Henning.—Tables are given showing the freight rates prior to 1915, between 1915 and 1922, and the present rates from different shipping points within the State to Cleveland, Pittsburgh, Cincinnati, Baltimore, and Jersey City. The freight from Columbus to Cleveland amounted to 1.5 and 1.9 per cent, respectively, of the farm price of hogs and cattle in 1914, and averaged 1.9 and 3.2 per cent, respectively, for the first six months of 1926.

Index number of freight rates on Ohio farm products, G. F. Henning.—Index numbers of freight rates for farm products (rates prior to 1915=100) were found to be 105 from January 4, 1915, to June 26, 1917; 120.7 from June 27, 1917, to June 24, 1918; 150.9 from June 25, 1918, to August 25, 1920; 211.3 from August 26, 1920, to December 31, 1921; and 190.2 from January 1, 1922, to the present time. The present rates are relatively high as compared with the

prices of commodities, and especially with the prices of farm products, the indexes for which have been 156, 152, and 162, and 134, 133, and 159, respectively, for 1923, 1924, and 1925. It is pointed out that with the relatively high freight rates, Ohio farmers enjoy a better market outlet owing to their nearness to the markets.

Index numbers of production, wages, and prices, J. I. Falconer.—Index numbers previously noted (E. S. R., 55, p. 684) are continued through July, 1926.

A food survey of Lima, B. A. Wallace.—A table is given showing the annual per capita consumption of farm products produced locally and commodities competing with such products. The figures are based upon records secured from transportation agencies as to the amount of food products shipped into and out of the city.

Range and ranch studies in Wyoming, A. F. Vass (*Wyoming Sta. Bul. 147 (1926), pp. 93–151, figs. 13*).—This is part of a study of the cattle industry in the Northern Great Plains area of the United States made in 1925 by the agricultural experiment stations of Wyoming, Montana, North Dakota, and South Dakota in cooperation with the Bureau of Agricultural Economics and the Bureau of Animal Industry, U. S. D. A., to determine the factors and methods of management best for the area. This report is based on data from 60 ranches in Crook and Campbell Counties, Wyo., of which the average size was 7,115 acres and the average investment $53,777 per ranch. Of the land included, 45.6 per cent was owned by the operators, and 70 per cent of the remainder was leased from private owners. Cattle represented 31.3 per cent of the total investment, there being an average per ranch of 430 head, with an average investment of $39.18 per head, besides 114 calves. The annual cost of carrying per head was $15.42 for 1-, 2-, and 3-year-olds, $21.18 for cows, and an average of $18.14 for all classes, excluding calves. The average return on the investment per ranch was $3,044, equal to 5.66 per cent, but of this amount $1,658 was due to increase in the inventory. Taxes equaled 12.7 per cent and interest paid 18.4 per cent of the ranch income.

High land values, $8.13 per acre, without buildings or improvements, and a land tax of 10 cts. per acre made leasing more conducive to profits than ownership. Only one ranch of 21 having less than 20 per cent of the total capital invested in cattle showed any return on the investment, while 75 per cent of the ranches having 40 per cent or more of their capital in cattle showed returns of from 1 to 8 per cent on the investment. The turnover was 21.8 per cent, where calves were sold, as compared with 22.7 per cent where 3-year-old steers and 2-year-old heifers were sold. Where calves were sold, 68 per cent more cows were required to make possible the same total amount of sales. The cost of producing a 6-month-old calf was $37.06, or 10.2 cts. per pound. The cost of production after the 6-month period was 7.76 cts. per pound. The cost of producing calves was very high due to the very low calf crop, which averaged only 57.15 per cent as compared with 75 per cent for the best managed herds. The percentage of the calf crop increased as the number of cows per bull decreased, being 76 per cent where there was at least 1 bull for 20 cows. The labor cost was $4.32 per animal, and the running of 250 head was necessary for the most efficient handling of the labor. Of the total receipts, 35 per cent came from 3-year-old steers, 20 from cows, 17 from 2-year-old steers, and 9 per cent each from the sale of 1 and 4-year-old steers. Calves represented only 2 per cent.

The possibilities of Brazil as a competitor of the United States in cotton growing, B. Youngblood (*Texas Sta. Bul. 345 (1926), pp. 59, figs. 27*).—The short crops during the past few years and the increasing consumption of American cotton by American spinners have given impetus to a movement to

develop the cotton-growing possibilities of the British possessions and oth countries, notably Brazil. This bulletin gives a general description of t present development of and possibilities for agriculture and stock growing i Brazil and more detailed information regarding the status of cotton growi and the factors affecting it.

The acreage and production in 1924–25 in Brazil were 1,573,000 acres an 605,000 bales, respectively, as compared with 40,115,000 acres and 13,153,0 bales in the United States. About 20 per cent of the Brazilian crop is export at the present time. That country probably has more agricultural lands tha the United States, and it is possible to grow cotton in practically every Stat The soils and climate seem favorable to both quality and quantity productio the average yield per acre of lint cotton in 1920–1924 being 188 lbs. as com pared with 150.5 lbs. in the United States. It is thought that Brazil will gro increasing crops of cotton of the American upland, medium staple type, muc of which will be of superior quality, but greater quantities will be consume at home due to the growing population and the increasing per capita co sumption.

How soon, if ever, Brazil may increase her cotton exports to the point becoming a serious competitor of the United States is problematical, dependin upon whether the world supply materially exceeds the world demand as th cotton-growing possibilities of Brazil are developed.

Factors affecting the price of hogs, G. C. HAAS and M. EZEKIEL (*U. S. Dep Agr. Bul. 1440 (1926), pp. 68, figs. 30*).—This is a statistical study, based on th prices for heavy hogs at Chicago from January, 1896, through December, 192 made to determine a means of forecasting hog prices. The supply of hogs o the market and expected to arrive within a few months, the quantity of ho products in storage, the general price level, general business conditions, an the prices of alternative products were the dominant influences in the hog mar ket. The general levels of demand at home and abroad are important, bu ordinarily change only slowly.

Exhaustive trials of the different available series of data showed the one best suited in constructing an index of future prices to be (1) the corn-ho ratio, reflecting conditions most likely to cause changes in breeding plans; (2) the price of corn, indicating the weight to which hogs are likely to be fattened (3) the weight of hogs, indicating the current balance between corn prices hog prices, and breeding animals; and (4) the prices of industrial stocks, indi cating what the speculative community thinks of the outlook for general business conditions.

The statistical technique is presented by which formulas were arrived at for forecasting hog prices (1) in deviations from trend, considering the corn-hog differential, live weight of hogs, index of prices of industrial stocks, and price of corn; (2) by percentage changes, considering corn-hog differential and the index of prices of industrial stocks; and (3) future prices for hog products—short ribs and lard.

The deviation from trend method gave estimates for the pre-war period that covered 88 per cent of the variation in the monthly averages of the actual prices and 94 per cent of the variation, if only general movements of prices were considered. For the period July, 1924, to January, 1926, 65 per cent of the variation was covered. The errors in estimated prices obtained by use of the future hog-product method averaged about twice as great as with the deviation from trend method. Post-war trend of demand as yet has not become sufficiently stable to permit of estimates of its future course. The semiannual pig survey reports of the Department have made the market more responsive to future

changes in receipts and have changed the relative importance of the different factors in determining prices.

Crops and Markets, [data for October, 1926] (*U. S. Dept. Agr., Crops and Markets, 6 (1926), Nos. 16, pp. 241–256; 17, pp. 257–272; 18, pp. 273–288; 19, pp. 289–304*).—The usual market information, tabulations, summaries, and notes are given for the period October 4–30, 1926.

Monthly Supplement to Crops and Markets, [October, 1926] (*U. S. Dept. Agr., Crops and Markets, 3 (1926), Sup. 10, pp. 305–344, figs. 8*).—The usual tabulations, summaries, and notes regarding crops, livestock and livestock products, dairy products, fruit and vegetable shipments, prices and price movements of agricultural products, cold-storage holdings, seeds, exports of grain, etc., are given, together with reports for cotton as of September 16 and October 1 and a special report for tobacco as of October 1. Special articles and tabulations are included on the number of persons employed on farms, October, 1923, to October, 1926; farm wages and index numbers, 1910–1926, and farm wages by States for October, 1924–1926; the percentages of reduction from full yields per acre for different causes for 11 leading crops, 1909–1925, and for 4 States for corn for 1916–1925; the effect of the supply of potatoes on farm prices and crop values; and the monthly money income of farmers and business conditions, July, 1919, to June, 1926, inclusive.

The farmers' standard of living, E. L. KIRKPATRICK (*U. S. Dept. Agr. Bul. 1466 (1926), pp. 64, figs. 7*).—This is a socio-economic study of 2,886 white farm families of selected localities in 11 States. It includes 317 families in the New England States, 1,130 families in the Southern States, and 1,439 families in the North Central States, and covers the period 1922–1924. The studies were carried on by this Department in cooperation with 12 colleges and universities.

A table is given and analyzed showing for each State and group of States, by owners, tenants, and hired men, the size of family and household, the average value of goods used during one year, and the distribution of this value among the principal groups of goods furnished by the farm and purchased. The average size of family and household for the 2,886 farms was 4.4 and 4.8 persons, respectively. The total value of all goods used was $1,597.50 divided into food, $658.80; clothing, $234.90; house rent, $199.60; furniture and furnishings, $40.20; operation goods, $213.10; health, $61.60; advancement, $104.80; personal, $41.00; insurance, $40.80; and unclassified, $2.70. Of the total value of goods, $440.70 worth of food, $199.60 worth of rent, and $43.20 worth of fuel were furnished by the farm.

A table is given showing the distribution of the average value of goods among different groups of articles, proportions of total family living and of food furnished by the farm, and size of house, by steps of increase in the total value of goods used during one year. Comparisons are made between families of owners, tenants, and hired men in this study, between farm families of this study and farm families of other studies, and of farm families with workingmen's families.

A study is made of (1) the number and ages of children per family, the ages and formal education of the operator and the home maker, and isolation, in terms of distances from the local trading center, church, and high school, as factors influencing the demands and desires of the family; (2) the length of the work day, hours of rest, vacations, etc., as aspects of the standard of living; and (3) acres operated per farm, the period the operator has been a farm owner, mortgage indebtedness, and income from other sources as factors indica-

tive of ability to provide economic goods. The number and ages of children had a direct relation to the standard of living. The formal schooling of the operator and home maker, especially the latter, had a significant relation. The relation of the use of time to the value of goods and the distribution among the different groups of goods was insignificant. The relation between the standard of living and the size of farm was direct. A fairly significant relation existed between years of ownership and the standard of living. Mortgage indebtedness seemed to have no relation. Income from outside sources had a fairly significant relation.

Standard of living on Iowa farms, J. F. Thaden (*Iowa Sta. Bul. 238 (1926), pp. 81–140, figs. 8*).—This study analyzes the standard of living of farm families of 212 owners and 239 tenants in Boone, Story, and Sac Counties for the year ended July 1, 1923, and is a sequel to the bulletin previously noted (E. S. R., 56, p. 82). The cost consumptive powers or weights to be ascribed to the different individuals in determining household or family-size indexes for the different items of consumption are derived from the actual expenditures and activities shown by the survey schedules. Tables are given showing the relation to the standard of living of population, various economic factors, education, home library and reading matter, membership and participation in organizations, and various social factors.

The percentage of the total expenditures of the family devoted to advancement—formal education, reading matter, organization dues, church contributions, vacations, etc.—is taken as the index of the standard of living. This percentage increased slightly with the number of children up to 5, owners' families with 5 or more children at home spending 2 to 2½ times as large a percentage as families with few or no children. The cost consumption per unit was less and the percentage devoted to advancement greater where operators and farmers' wives were over 41 and 45 years old, respectively. The percentage of the total expenditures devoted to miscellaneous purposes increased from 17.2 in families with total expenditures less than $900 to 36.9 per cent in families with expenditures over $2,500. The size of the farm, value of land per acre, value of farm, value of house, and the ratio of the value of the house to the value of the farm had rather close relationship to one another, but none of them seemed to bear any relationship to the average cost consumption per unit or to the percentage of the total expenditures for advancement. The standard of living rose with better education of the parents, membership and active participation in social, fraternal, and economic organizations, and attendance at church and financial support to religious organizations. The extent of the education of the children was the best single factor indicating the family's standard of living. The total expenditures for advancement rose with increased expenditures for vacations and trips, the shortening of the work day, and the modernness of the house. Former residence in town or city, employment of hired help, and the carrying of life and health insurance had but slight effect.

An increase in the percentage of the total expenditure for advancement was accompanied by an increase in the average total household expenditures, both per family and per cost consumption unit. The percentage for clothing, furnishings, and personal expenses increased, but those for food, rent, and maintenance of health decreased and those for operating expenses and insurance remained practically the same. The percentage of food, fuel, and shelter furnished by the farm also decreased as the total expenditures increased.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Report on agricultural education in the financial year 1924–25 (*Jour. Min. Agr. [Gt. Brit.], 33 (1926), No. 8, pp. 711–729*).—A general report of the activities of the Ministry of Agriculture of Great Britain in connection with agricultural education during the year 1924–25.

The book of rural life, edited by J. A. Bellows, E. M. Tuttle, J. H. Grisdale, et al. (*Chicago: Bellows-Durham Co., 1925, vols. 1-10, pp. XXXVIII+6210, illus.*).—A reference book on rural life for schools and homes, consisting of one or more signed articles by 250 men and women, a large number of whom are connected with the leading agricultural institutions of the United States and Canada. The articles are arranged alphabetically and cover different phases of the subjects of agriculture, home economics, health, education and culture, science, and civic and business relationships. The volumes are profusely illustrated, there being 35 full page color plates, 19 colored maps occupying one or two pages, 128 full page sepia plates, and approximately as many halftone and line drawing text figures as pages. A classified arrangement of the articles is given in a readers' research guide at the end of the tenth volume.

Laboratory manual in general microbiology, W. Giltner et al. (*New York: John Wiley & Sons; London: Chapman & Hall, 1926, 3. ed., pp. XXVI+472, pls. 6, figs. [82]*).—This is a third edition of the work previously noted (E. S. R., 35, p. 593).

Laboratory experiments in dairy chemistry, L. S. Palmer (*New York: John Wiley & Sons; London: Chapman & Hall, 1926, pp. XIII+84*).—This laboratory manual has been developed to supplement the lectures in the course in dairy chemistry given by the division of agricultural biochemistry of the University of Minnesota. Thirty-seven experiments are given under eight topics as follows: Physical and chemical properties of milk, isolation and properties of milk constituents, chemical and physicochemical state of milk constituents, butter, rennet coagulation, qualitative analysis of Cheddar cheese, qualitative examination of milk powder, and quantitative analysis of milk. Selected references for supplementary reading, classified by the experiments upon which they have a bearing, and several tables are appended.

Agricultural surveying, including mensuration, road construction, and drainage, J. Malcolm (*London: Univ. Tutorial Press, 1926, pp. VII+313, figs. 187*).—An elementary textbook on surveying for agricultural students and farmers.

A history of economic progress in the United States, W. W. Jennings (*New York: Thomas Y. Crowell Co., 1926, pp. XVI+819, pl. 1*).—This is a college textbook. The history is divided into five periods, with a chapter on agriculture included for each period.

Readings in marketing principles, I. Wright and C. A. Landon (*New York: Prentice-Hall, 1926, pp. [XI]+799, figs. 29*).—A collection of readings covering the subjects ordinarily included in a basic college or university course in marketing. Chapters are included on assembling county products, cooperative marketing in agriculture, and cooperative marketing by commodities, besides numerous articles pertaining to agricultural products in other chapters.

Community organization, J. F. Steiner (*New York and London: Century Co., 1925, pp. X+395*).—This text for colleges, universities, and schools of social work is "a comparative study of various types of organization based upon a sociological analysis of the community." It is divided into three parts dealing with the community movement and social progress, typical experiments in community organization, and theories and principles of community organization. A selected bibliography is given for each chapter.

FOODS—HUMAN NUTRITION

The biological value of the nitrogen of mixtures of patent white flour and animal foods, H. H. MITCHELL and G. G. CARMAN (*Jour. Biol. Chem., 68 (1926), No. 1, pp. 183–215*).—The method previously noted (E. S. R., 51, p. 407) has been applied to the determination of the biological values of the nitrogen of white flour and various animal proteins and of mixtures of the white flour with the animal foods in the proportion of one part of nitrogen from the animal food to two parts from the white flour. The purpose of testing the various combinations was to obtain an estimate of the supplementing action of the various animal proteins for the deficient flour protein. The data were obtained in general on two groups of five rats each.

The average biological values of the nitrogen of the foods tested separately were white flour 52, whole egg 94, egg albumin 83, milk 85, veal 62, and beef 69. The values obtained for the various combinations and the calculated values of the same combination on the assumption of no supplementary relationship were, respectively, as follows: Flour and whole egg 75 and 66, flour and milk 71 and 62, flour and egg albumin 66 and 64, flour and veal 62 and 53, and flour and beef 73 and 60. According to these figures the supplementary relationship was greatest between flour and beef and least between flour and egg albumin.

Proteins of wheat bran.—III, The nutritive properties of the proteins of wheat bran, J. C. MURPHY and D. B. JONES (*Jour. Biol. Chem., 69 (1926), No. 1, pp. 85–99, figs. 4*).—The conclusion drawn in the previous paper of the series (E. S. R., 54, p. 309), that the proteins of wheat bran are of a high nutritive value as judged by their amino acid make-up, has been substantiated in the present biological study.

When fed to young rats as the sole source of protein to the extent of 70 per cent of the ration, commercial wheat bran promoted growth at better than normal rates for 15 or 16 weeks. On washed bran growth was not so rapid. On patent flour as the sole source of protein in a similar ration, growth was much less rapid, the gain of weight per gram of protein eaten being only 0.88 gm. as compared with 1.83 gm. for the bran. After the first 16 weeks, however, growth was at a standstill on the bran ration and progressed at about the same rate on the flour. Fecundity was low on the bran ration, and but few of the young born were raised.

In discussing the results obtained, the authors advance the opinion that "wheat bran contains in abundance the factors which meet the animal's nutritional requirements during the period of its most active growth, but is deficient in some other factor or factors which are required for the animal's normal development after it has reached maturity. The white flour diet, on the other hand, although inadequate to meet the requirements of early growth satisfied to a better degree the requirements of the more mature animal. Whether these differences in the nutritive properties of the bran and flour diets are to be ascribed to the protein, or amino acid factor, or whether they are due to some nutritionally essential nonprotein constituent must for the present remain undecided."

The use of sodium nitrite in the curing of meat, R. H. KERR, C. T. N. MARSH, W. F. SCHROEDER, and E. A. BOYER (*Jour. Agr. Research [U. S.], 33 (1926), No. 6, pp. 541–551*).—This is a general discussion, with selected data, of the cooperative project conducted by Federally inspected meat establishments to determine the feasibility of the substitution of sodium nitrite for sodium or potassium nitrate in the curing of meat. The experiments along this line

conducted by the Institute of American Meat Packers have been noted previously from a report by Lewis and Vose (E. S. R., 55, p. 591).

The general conclusions drawn from the entire series of studies are that sodium nitrite can be successfully substituted for sodium or potassium nitrate in the curing of meat, with a shortening of the customary curing process, and that meats thus cured need contain no more nitrites than meats cured with nitrates and have the advantage of being free from unconverted nitrates regularly present in nitrate-cured meats. It has been found that from 0.25 to 1 oz. of sodium nitrite is sufficient to fix the color in 100 lbs. of meat, the exact quantity depending on the meat to be cured and the process to be employed.

As a result of this investigation the use of sodium nitrite in meat curing in Federally inspected establishments has been formally authorized by the U. S. Department of Agriculture, subject to meat-inspection regulations.

A contribution to the bacteriological study of ham souring, E. A. Boyer (*Jour. Agr. Research* [*U. S.*], *33* (*1926*), *No. 8*, *pp. 761–768*).—"Hams from dressed hog carcasses taken from the killing floor 45 minutes after slaughter were found to harbor microorganisms in the interior musculature, synovial fluid, and bone marrow. Similar organisms were found in hams from carcasses scalded in a steam cooker and scraped by hand, and in hams taken from the carcasses as soon as bleeding had been completed. Five species of anaerobes, namely, *Bacillus putrefaciens*, *B. histolyticus*, *B. sporogenes*, *B. tertius*, and an unidentified organism resembling *B. oedematiens* in some respects, were isolated from such hams. There were also present numerous and varied aerobic organisms. No organisms of the *B. coli* group were found, although a special search was made for them. It is concluded, therefore, that this group is rarely, if ever, present in the bacterial flora of fresh hams. There is no evidence that any of the organisms found gained access through killing-floor operations.

"From the foregoing data it is concluded that the organisms responsible for ham souring are disseminated throughout the carcass from the moment of slaughter and possibly are present in the blood and tissues of the living animal. It is evident, therefore, that access of these organisms can not be prevented by any alteration of killing-floor operations or practices. Prevention of ham souring depends, therefore, on preventing the development of the causative organisms which are known to be present. Prompt handling and prompt and efficient chilling resulting in early attainment of the low temperatures required to check the development of *B. putrefaciens* and similar organisms, and maintenance of uniform low temperatures until sufficient salt has been taken up by the ham to hold these organisms in permanent check, are the means of prevention indicated. The effectiveness of these methods is shown in a practical way by the low rate of spoilage attained by those establishments at which they are consistently practiced."

A study of the manufacture of water ices and sherbets, A. C. Dahlberg (*New York State Sta. Bul. 536* (*1926*), *pp. 3–30*, *figs. 2*).—This study was undertaken for the purpose of devising methods of preparing water ices and sherbets which would overcome some of the difficulties at present encountered in their manufacture. The terms water ice and sherbet are defined as follows: "A water ice is a semifrozen product made of water, sugar, and fruit juice which may or may not contain added color, flavor, fruit acid, and stabilizer. A sherbet is a semifrozen product made of the same ingredients as a water ice except that it also contains milk or milk products." The chief difficulty to overcome was the tendency for the unfrozen sirup to drain out of the semi-

frozen product during storage, with the result that the ice is exceedingly hard in the upper part of the container and soft or mushy in the lower part.

The first point studied was the influence of the sugar concentration and the percentage of overrun upon the hardness of the product. A sugar concentration of from 30 to 33 per cent and an overrun of 20 to 30 per cent were established as optimum for obtaining products comparable in hardness to ice cream at the same temperature.

Of various materials tested alone and in combination as stabilizers, India gum of good quality prevented most of the sirup from draining out, but did not overcome the tendency of the frozen product to crumble. Gelatin made a smooth product, but it was impossible to reduce the overrun to the desired amount. Gelatin and low-grade India gum were precipitated by each other, and a mixture of gelatin and gum tragacanth or high-grade India gum could not be whipped readily. This difficulty in whipping was also true of agar in a concentration of about 0.2 per cent. The most satisfactory results were obtained with a combination of agar with milk proteins, gelatin, gum tragacanth, or high-grade India gum. The substitution of corn sugar for 20 or 25 per cent of the sucrose still further improved the quality of the product by preventing the crystallization of the sucrose and the formation of ice particles. A satisfactory formula for water ice embodying all the recommendations is given as follows: Cane sugar 25, corn sugar 7, agar 0.2, gum tragacanth or high-grade India gum 0.4, and water, fruit, fruit acid, flavor, and color 67.4 lbs. This is said to give an overrun of 20 to 25 per cent and a total yield of 13 gal. For sherbets the same amounts of the first three ingredients are recommended, with 0.2 lb. of gum tragacanth, 50 lbs. of whole milk, and 17.6 lbs. of water, fruit, etc. This gives an overrun of from 25 to 30 per cent and a yield of 13.5 gal. In place of the whole milk ice cream mix without sugar or gelatin can be used, the directions calling for 10 lbs. of the mix and 57.6 lbs. of the water, fruit, etc.

Vitamin studies.—XIII, Vitamin B in evaporated milks made by vacuum and aeration processes, R. A. DUTCHER and E. FRANCIS (*Jour. Dairy Sci., 9 (1926), No. 4, pp. 379–387, figs. 2*).—This continuation of the series of vitamin studies at the Pennsylvania Experiment Station, the preceding number of which by Souba, Knandel, and Dutcher has been noted (E. S. R., 54, p. 670) has been noted essentially from a progress report (E. S. R., 52, p. 201).

The general conclusion drawn is that "vitamin B is not readily destroyed by the evaporation methods described, and only under unusual conditions would we expect the vitamin B deficiency of commercial evaporated milks to be due to methods of manufacture." In the control tests with raw milk, fairly normal growth was secured with 12 cc. of milk daily. This would indicate that the Pennsylvania herd milk used was slightly superior in its vitamin B content to that described by Osborne, Mendel, et al. (E. S. R., 39, p. 570) and slightly inferior to the Minnesota milk described by Kennedy and Dutcher (E. S. R., 47, p. 78).

Vitamin studies.—XIV, The influence of ultra-violet light on the antirachitic properties of purified rations used in the study of vitamin A, R. A. DUTCHER and J. H. KRUGER (*Jour. Biol. Chem., 69 (1926), No. 2, pp. 277–282*).—The authors have attempted to discover which constituent of the basal ration used in their vitamin A studies responds most readily to irradiation, for the purpose of securing an abundance of the antirachitic vitamin now considered to be an essential ingredient in basal diets to be used for vitamin A studies.

The basal ration used consisted of purified casein 18, agar 2, salt mixture 3, and dextrin 77 parts. A comparison of the growth of nonirradiated rats re-

ceiving this ration untreated and irradiated and of irradiated rats receiving the nonirradiated ration showed that loss in weight was delayed by irradiation of either the ration or the animals themselves. The separate ingredients of the ration were then irradiated, one at a time, and the extent of increase in antirachitic properties was tested by determinations of the ash content of the femur and humerus of the rats on the fourteenth day of feeding. No change was made in the constituents of the ration, except that of one group in which 2 per cent of corn oil replaced 2 per cent of dextrin. The percentage of bone ash was markedly increased by irradiation of the dextrin and corn oil, but not to any extent by irradiation of the other ingredients of the ration. Since irradiation of 2 gm. of corn oil brought about the same degree of calcification as that of 77 parts of dextrin, it was concluded that irradiated corn oil is at least 38 times as potent as irradiated dextrin. The addition of irradiated corn or olive oil to basal vitamin A-free rations is recommended.

Studies upon the inorganic composition of bones, J. Howland, W. McK. Marriott, and B. Kramer (*Jour. Biol. Chem., 68 (1926), No. 3, pp. 721–728*).—From bone analyses by the methods previously described (E. S. R., 56, p. 14), it is conclnded that the calcium phosphate compound in all bones, rachitic or nonrachitic, is tricalcium phosphate, that different bones of the same individual have the same inorganic composition, and that the ratio of calcium phosphtae to calcium carbonate is higher in the bones of normal than of rachitic animals. Precipitates made from solutions comparable in their inorganic composition to the serum of normal and rachitic animals were found to contain essentially the same calcium phosphate compound as bone. The ratio of calcium phosphate to calcium carbonate in these precipitates was found to vary directly with the inorganic phosphorus content of the solution.

The relation of the rate of growth to diet, I, T. B. Osborne and L. B. Mendel (*Jour. Biol. Chem., 69 (1926), No. 2, pp. 661–673, figs. 5*).—In this investigation, which has been noted briefly from a progress report (E. S. R., 55, p. 189), the authors with the cooperation of H. C. Cannon have attempted to prepare single food mixtures for their stock rats which would be more convenient and efficient than the dog biscuit-green food ration hitherto used in their colony. In the course of this work combinations were secured on which growth has been accelerated far beyond the Donaldson standards.

On a biscuit prepared from red dog flour 65, meat scrap 12, commercial casein 12, alfalfa 10, and sodium chloride 1 per cent, with 1 mg. of potassium iodide for each kilogram of the mixture, the average time required for making the gain in weight from 60 to 200 gm. was 38 days as compared with 43 days, the maximum rate of gain reported by King, and 65 days by Greenman and Duhring. Several other efficient food combinations are summarized, with the time required to make gains in body weight from 60 to 200 and 300 gm., respectively. These, together with graphic records and photographs, show the marked increase in growth which can be brought about by selective feeding. It is noted, moreover, that the increase in rate of growth can also be initiated when the change in ration is made considerably later than in most of the experiments reported.

No definite conclusions have been drawn as yet in explanation of the acceleration of growth, although it is suggested that hitherto unappreciated cell constituents may be partly responsible. Whether the rapid initial growth will result in definitely larger adults and whether it is truly normal from a morphological and physiological standpoint have yet to be determined.

The effect of light on creatinine and creatine excretion and basal metabolism, M. Eichelberger (*Jour. Biol. Chem., 69 (1926), No. 1, pp. 17–28*).—Expo-

sure for an hour to direct sunlight or for 50 minutes to the light of a carbon arc lamp is reported to have increased the creatinine excretion during the period of irradiation and decreased it for several hours thereafter in a group of young women subjects and also in two young girls. The creatine excretion was not affected. Creatinine excretion was also increased by exercise, in some cases to a higher degree than by irradiation. No significant alterations in basal metabolism resulted from irradiation.

Intestinal chemistry, IV–VII, O. Bergeim (*Jour. Biol. Chem., 70 (1926), No. 1, pp. 29–58, figs. 7*).—In continuation of the series of studies previously noted (E. S. R., 55, p. 190), four papers are presented.

IV. *A method for the study of food utilization or digestibility.*—The method described is an adaptation of the one described in the first paper of the series (E. S. R., 52, p. 862), involving the incorporation of ferric oxide in the food. In the present case, the percentage utilization of any food is calculated by determining the ratio of the amount of the food substance ingested to the amount of iron in the food and in the feces. The method is said to be applicable to studies on small animals, such as white rats, and to have the advantage over the usual method in not requiring the separation and complete collection of the feces.

V. *Carbohydrates and calcium and phosphorus absorption.*—The method noted above has been applied in a study of the effect upon calcium and phosphorus absorption from the intestines of the addition of various carbohydrates to the ration. The experiments were conducted on young rats on a basal diet of whole wheat 33, gelatin 15, wheat gluten 15, whole yellow corn 33, sodium chloride 1, calcium carbonate 3, agar 0.5, and ferric oxide 0.2 per cent. The calcium and phosphorus absorption on the control diet was determined for each rat during two successive 4-day periods, and on the modified diets on successive 4-day periods, with 2 days' interval between.

Starch, glucose, fructose, and maltose were without effect on the calcium and phosphorus absorption when fed at a 25 per cent level, but caused a small increase at 50 per cent. Dextrin had little effect in the smaller amounts but a more marked effect in the larger. Lactose even at a 25 per cent level caused a marked increase in the calcium and phosphorus absorption, particularly the former. The effect of these carbohydrates is considered to be due to increased lactic acid fermentation in the intestines, with resulting increased acidity of the intestinal contents which would be more marked with lactose than with the other carbohydrates.

VI. *A method for the study of absorption in different parts of the gastro-intestinal tract.*—In this application of the method outlined in Part IV, the food in question is fed to the experimental animals for 24 hours or more, or until all residues of the preceding diet have left the intestines, and is then given in small amounts at frequent intervals. After several feedings the animal is killed and the contents of various parts of the intestinal tract examined. As an alternative several animals may be fed a single meal and killed at different times, or an animal with a series of fistulas may be used.

VII. *The absorption of calcium and phosphorus in the small and large intestines.*—Using the method outlined in the preceding paper, a study was made of the effect of cod-liver oil as the source of the antirachitic vitamin on the absorption of calcium and phosphorus from different parts of the intestinal tract of rats on a high-calcium-low-phosphorus diet. Three rats were fed this diet supplemented by 10 drops daily of inactive olive oil and three by the same amount of cod-liver oil. Three others received a high-calcium-high-phosphorus diet consisting of equal parts of powdered milk and cornstarch.

In all groups there was a considerable degree of calcium absorption from the small intestine, indicating that the rachitic condition could not be due to a failure of absorption. In all groups there was a marked excretion of phosphate into the small intestines. The normal animals showed normal calcium and phosphorus balances throughout the intestines. In the rachitic animals the excretion of calcium into the lower intestine was more marked than the absorption, thus leading to a negative balance. This was accompanied by a failure of phosphate to be reabsorbed.

"The failure of absorbed calcium to be used in calcification is believed to be due to the low phosphate concentration of the blood. Antirachitic substance may act by elevating blood phosphate by promoting the breakdown of organic tissue phosphates, thus leading to increased deposition of calcium with lessened excretion into the gut and consequent better absorption of phosphate therefrom."

Studies of the metabolism of women.—II, Cyclic variations in uric acid and total nonprotein nitrogen content of blood, R. OKEY and S. E. ERIKSON (*Jour. Biol. Chem., 68 (1926), No. 3, pp. 687–709, fig. 1*).—The investigation previously noted (E. S. R., 54, p. 592) has been extended to a study of the blood uric acid levels and nonprotein nitrogen content of the blood during the menstrual period in college women, many of them subjects of the previous study. In all 271 samples covering 37 monthly periods in 22 subjects were analyzed. On the basis of the data obtained, the conclusion is drawn that in most normal women there is a tendency for the blood uric acid to reach a high level immeditaely preceding menstruation. This is followed by a decrease during menstruation and a second increase shortly after the close of the period. The average values at these periods in terms of intermenstrual values were 105.8, 86.4, and 105 per cent. The values obtained in 92 observations of the blood uric acid levels of 9 men showed no greater variations than those observed in the women subjects during the intermenstrual period.

Observations on the total nonprotein content of the blood showed a tendency toward high levels during or just after the menstrual period. Preliminary observations of the nitrogen partition showed no consistent cyclic changes in the levels of creatine, creatinine, urea, and amino acids. This is thought to indicate that the rest nitrogen fraction alone is involved.

Various theories in explanation of the fluctuations in nitrogen distribution are discussed.

TEXTILES AND CLOTHING

Fibres, textiles, cellulose, and paper, D. J. NORMAN (*Soc. Chem. Indus. [London], Ann. Rpts. Prog. Appl. Chem., 10 (1925), pp. 137–164*).—A review of technical research in 1925 on cellulose, cotton, and allied fibers, silk, wool, nitrocellulose, rayon, and paper-making materials.

New method of depicting fiber cross sections [trans. title], A. HERZOG (*Melliand Textilber., 7 (1926), No. 11, pp. 925–927, figs. 7*).—The details of the method are set forth, with illustrations of the apparatus employed.

Spinning tests of leading varieties of Texas cotton (crop of 1924), H. H. WILLIS (*U. S. Dept. Agr., Bur. Agr. Econ., 1926, pp. 20, figs. 3*).—A preliminary report of tests in cooperation with Clemson Agricultural College on Acala, Lone Star, Kekchi, Mebane, Rowden, Kasch, and Hoground (mixed) cotton grown in Texas in 1924 gives environmental and field data, grades, staple, and the usual spinning test data.

The test results on the 1924 crop, which tend to substantiate those of the 1923 crop, indicate that all of these varieties may be spun into satisfactory

22s and 28s yarn; that Acala, Lone Star, Kekchi, Mebane, and Rowden may be spun into satisfactory 36s yarn; and that Acala, Lone Star, and Kekchi may be made into 44s yarn for some purposes.

Spinning tests of leading varieties of North Carolina cottons (crop of 1925), H. H. Willis (*U. S. Dept. Agr., Bur. Agr. Econ., 1926, pp. 28*).—This is a preliminary report of spinning tests made in cooperation with Clemson Agricultural College on the Trice, Sugar Loaf, Cleveland, Acala varieties, and strains of the Mexican variety of cotton grown in several localities in North Carolina. Environmental and yield data are given in addition to the usual spinning test data and a formula which has been devised for estimating the breaking strength of 28s yarn.

The breaking of yarns and single cotton hairs, G. G. Clegg (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 5 (1926), No. 18, pp. 223–238, figs. 11*).—The Congo Red staining method (E. S. R., 55, p. 695) has made it possible to determine the number and character of all the fiber present at the point of breakage, the average number of fibers ending naturally in the portion of yarn in which the break occurs, and the number of fibers actually broken. The average number of fibers in the yarn cross section is found by counting those at a cut end.

Use of this technique on a number of yarns broken on a single-thread tester or a ballistic instrument gave evidence that yarn does not usually break by slipping of the individual hairs. In reality a considerable proportion of the hairs are actually broken, as many as 70 per cent in a Sakel 30's weft. No definite relation was apparent between the breaking load of a raw cotton and that of the yarn itself. This seemed largely due to the indefiniteness of the quantity determined as the single fiber-breaking load, and the effects of two contributing factors, presence of abnormal hairs and length of test specimen, were examined. No direct relation was shown between the single fiber-breaking load and the wall thickness of the fibers.

Variations in damped knitting yarns, W. Davis (*Wool Rec. [Bradford], 30 (1926), No. 916, pp. 1524–1527, figs. 10*).—Experiments showed that after damping wool yarns there is a rapid alteration in the tensile and stretch properties, which reaches its maximum intensity about 4 hours after lubrication. After this time there is a gradual return toward normal conditions. This return, however, is in no case complete before 24 hours have elapsed, during which period all of the yarn wound is supposed to be worked up on the frame; otherwise the effects of lubrication must be maintained by placing the wound yarns in a damp atmosphere. In tests on 18's and 2/18's worsted hosiery yarns, which were damped with different lubricating substances and the effects noted at various periods, the general behavior was similar in each case.

The effect of atmospheric influences on wool and cloth [trans. title], A. Kertess (*Melliand Textilber., 7 (1926), No. 11, pp. 928, 929*).—Microscopic study of natural white wool and samples of gray army cloth that had been exposed to the action of the atmosphere for about a year did not show an appreciable change in appearance of the fibers, but they were exceedingly brittle and easily broken into short fragments. Conclusions which confirmed earlier investigations are that the action of the atmosphere, especially light, causes a chemical deterioration with a considerable concurrent reduction in quality.

Bleaching, dyeing, printing, and finishing, A. J. Hall (*Soc. Chem. Indus. [London], Ann. Rpts. Prog. Appl. Chem., 10 (1925), pp. 165–187*).—Activities of the bleaching, dyeing, printing, and finishing industries are reviewed for 1925, and summaries are given of the patent and research publications brought forth during the year.

MISCELLANEOUS

National problems for cooperation, agricultural experiment stations and U. S. Department of Agriculture (*U. S. Dept. Agr., Off. Expt. Stas., 1927, p. [3]+41*).—This revision is referred to editorially on page 101.

Report [of Florida Station] for the fiscal year ending June 30, 1920, P. H. Rolfs et al. (*Florida Sta. Rpt. 1920, pp. 45+II, figs. 2*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1920, a list of the publications of the year, a general review of the work of the station during the year, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue.

Report of Moses Fell Annex, Bedford, Indiana, June, 1926, H. J. Reed and E. W. Moore (*Indiana Sta. Circ. 135 (1926), pp. 15, figs. 5*).—The experimental work summarized in this report is for the most part abstracted elsewhere in this issue.

Thirty-eighth Annual Report of [Kentucky Station, 1925, I], T. P. Cooper (*Kentucky Sta. Rpt. 1925, pt. 1, pp. 34*).—Part 1 of this report contains the organization list, a financial statement as to the Federal funds for the fiscal year ended June 30, 1925, a report of the director on the work and publications of the year, and meteorological data. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

The Thirty-eighth Annual Report of the Maryland Agricultural Experiment Station, [1925], H. J. Patterson (*Maryland Sta. Rpt. 1925, pp. XX+189, figs. 79*).—This contains the organization list, a report by the director on the work and publications of the station, a financial statement for the fiscal year ended June 30, 1925, and reprints of Bulletins 268–273, all of which have been previously noted. Experimental work with field crops is noted on page 132.

Some new facts from the Montana Experiment Station: Thirty-second Annual Report, July 1, 1924, to June 30, 1925, F. B. Linfield (*Montana Sta. Rpt. 1925, pp. 60, figs. 22*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1925, and a report of the director on the work of the station. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

Thirty-ninth Annual Report of the Pennsylvania Agricultural Experiment Station, [1926], [R. L. Watts] (*Pennsylvania Sta. Bul. 204 (1926), pp. 47, figs. 10*).—This bulletin discusses briefly the work of the station for the year ended June 30, 1926, including a financial statement for this period. The experimental work recorded and not previously noted is for the most part abstracted elsewhere in this issue.

Thirty-eighth Annual Report [of Tennessee Station], 1925, C. A. Mooers et al. (*Tennessee Sta. Rpt. 1925, pp. 24, figs. 2*).—This contains the organization list, an account of the work of the station, and a financial statement for the fiscal year ended June 30, 1925. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

Bimonthly Bulletin of the Ohio Agricultural Experiment Station, [September–October, 1926] (*Ohio Sta. Bimo. Bul., 11 (1926), No. 5, pp. 161–208, figs. 7*).—This number contains, in addition to several articles abstracted elsewhere in this issue, the following: Ohio Sportsmen Plant 45,000 Forest Trees, Orchard Trees Need Nitrogen, and Feeding Dairy Cows.

NOTES

Arizona University.—President C. H. Marvin, the chancellor of the board of regents, and three other members of the board have tendered their resignations.

California University and Station.—L. J. Fletcher, head of the agricultural engineering division, resigned December 30, 1926, to engage in commercial work.

Colorado Station.—A wooden building used to house the work of the station in animal husbandry, dairy husbandry, veterinary science, and poultry was burned January 28, together with the R. O. T. C. building and the Government arsenal. The loss is estimated at $200,000.

Connecticut College.—Approximately $500,000 is being requested from the General Assembly for new construction. The largest item is that of $435,720 for a classroom building to replace a frame structure erected in 1890. Other items in the estimates include $19,920 for equipment for fruit storage, $47,622 for enlargement of the filter beds, and $32,000 for four faculty cottages.

Massachusetts Station.—The resignations are noted of Gerald M. Gilligan and Orman E. Street, investigators in chemistry and agronomy, respectively. Recent appointments include Miss Esther S. Davies and Linus H. Jones, assistant research professors of home economics and botany, respectively, and the following investigators: Robert S. Horne, agronomy; Joseph L. Kelley, cranberry studies; Ronald L. Mighell, farm management; Paul R. Nelson, chemistry; and Ray G. Smiley, pomology.

Michigan College and Station.—Edward D. Devereaux has been appointed assistant professor and research assistant in bacteriology. R. V. Gunn has been appointed extension specialist in economics.

Minnesota University.—Work has been begun on a plant industry building, which, with equipment, is to cost $250,000. This building will house the division of agricultural biochemistry and will furnish much needed laboratory equipment for the entire plant industry group. It will be a three-story and basement structure of brick and limestone, 154 by 65 ft. in size, and is expected to be ready for occupancy September 1.

Missouri University.—The total attendance at Farmers' Week held from January 17 to 21 was 1,263, of whom 383 were women. There were represented 96 Missouri counties and 12 other States.

A new marketing course of three days' duration was held from February 8 to 10 for officers, managers, and members of cooperative marketing associations in cooperation with farmers' organizations of the State and the U. S. Department of Agriculture.

Montana College.—Miss Florence Fallgatter, acting head of the home economics department, has been appointed field agent for home economics in the central and Pacific coast regions by the Federal Board for Vocational Education, succeeding Miss Mabel V. Campbell, who has resigned to become chairman of the department of home economics of the University of Missouri.

Nebraska University.—A new dairy building costing $50,000 was dedicated October 21, 1926. It is a brick building with asbestos shingles, 131 by 197 ft. It includes a milk house, accommodates 52 cows in stanchions, together with box stalls for 4 cows, and is equipped with many labor-saving devices.

Rutgers University.—A week's marketing institute was held beginning January 24.

New Mexico College and Station.—Work was recently begun by the station and the extension division on a Purnell project entitled The Determination of the Economic Possibilities of the Storage and Keeping Qualities of New Mexico Eggs.

New York State Station.—The addition of plaster of Paris to dust mixtures used in fighting the pear psylla, one of the most troublesome pear pests in New York, has proved quite effective in controlling this insect in the Hudson River Valley. The new dust mixture is harmless to pear foliage and costs only about 3 cts. a pound, this amount being sufficient to cover the average-sized pear tree. The treatment is useful chiefly in the early stages of the insect's development, when the moist bodies of the young psyllas cause the plaster of Paris to set in a hard case, thus causing suffocation. The dust mixture suggested for these stages contains four parts of freshly hydrated lime to one part of high-grade plaster of Paris. For later use, nicotine sulfate may be added, and sulfur or copper dust or lead arsenate may be substituted for a part of the lime for special purposes. It is thought that the plaster of Paris dust may also prove effective against other orchard pests, and tests are now in progress to discover how they may be used to the best advantage.

As a result of recent station tests, in which such varieties as Delaware, Campbell, Niagara, Concord, Iona, and Catawba were grafted on rootstocks of Clinton, Riparis Gloire, and Rupestris St. George and grown beside own-rooted vines propagated in the usual way, it is believed that American grapes can be materially improved in quality, that yields can be increased, and that more vigorous vines can be obtained by bench grafting desirable varieties on suitable stocks. While at present the cost of grafted stock will probably be too great for use in commercial plantings, improved methods of grafting may lower this cost and eventually prove practicable. For home planting, the immediate benefits to be secured from grafted stock are believed to justify the slightly greater cost both in the production of better fruit and the greater assurance of success.

Pennsylvania College and Station.—R. B. Maxwell resigned December 1, 1926, as instructor in storage research. Recent appointments include J. M. Huffington as assistant professor of vegetable gardening extension, Howard O. Triebold as instructor in agricultural chemistry, and Arthur C. McIntyre as research assistant in forestry.

South Dakota College and Station.—Guy H. Harvey of Yankton and W. S. Dolan of Milbank have been appointed regents of education, and Alvin Wagner of Philip has been reappointed to the position. Turner R. H. Wright, livestock specialist in the extension service, was transferred January 1 to the department of animal husbandry as associate professor of animal husbandry.

Texas Station.—Dr. P. C. Mangelsdorf, assistant geneticist at the Connecticut State Station, has been appointed agronomist in charge of corn and small grain investigations and entered upon his new duties January 1.

Vermont University.—The Ira Allen Chapel, named in honor of the founder of the university and the gift of Hon. James B. Wilbur of Manchester, was dedicated January 14. It is a brick colonial structure, 135 by 90 ft. in size,

with a 170-ft. campanile. The seating capacity of the auditorium is 1,000. Special attention has been given to its acoustics, and a three-manual grand concert organ has been installed.

West Virginia University and Station.—Dr. J. H. Rietz, professor of veterinary medicine and advisory veterinarian in the station, has been appointed veterinarian in the department of animal husbandry, beginning January 1, thereby filling a vacancy which has existed since the resignation of Dr. C. A. Lueder in September, 1924. E. C. Stillwell, assistant professor in the College of Agriculture and junior animal husbandman in the station, resigned January 1.

Wisconsin University and Station.—At the request of the Wisconsin Utilities Association the first short course in tree trimming for line foremen was offered by the department of horticulture from February 8 to 12.

The radio committee of the College of Agriculture has cooperated with the university committee in a series of farm and home radio programs given weekly during January.

Walter H. Ebling has resigned as assistant to the dean and director, effective January 1, to accept the position of State agricultural statistician. Reid F. Murray has resigned as secretary of the Wisconsin Livestock Breeders' Association and extension specialist in animal husbandry, and has been succeeded by Arlie M. Mucks, county agent of Barron County.

Office of Experiment Stations.—H. W. Marston, instructor in animal husbandry and assistant animal husbandman in the Kansas College and Station, has been appointed associate animal husbandman. He will have charge of the abstracting for *Experiment Station Record* in the sections of animal production and dairying and dairy farming, relieving George Haines, who while retaining his connection with the section of genetics will devote the greater part of his time to the work of the Office dealing with its direct relations with the experiment stations.

Survey of Land-Grant Colleges and Universities.—Under a provision of the act signed January 12 making appropriations for the support of the Department of the Interior for the fiscal year ending June 30, 1928, the Bureau of Education is granted $61,000 to make a study of the organization, administration, and work of the land-grant institutions. The total cost of the survey is expected to be $117,000. The survey is the result of discussion and action in the Association of Land-Grant Colleges and Universities and received the indorsement of the association in 1925 and 1926. It is expected that special attention will be given to agricultural and home economics education.

National Agricultural College Student Council.—According to a note in *Agricultural Student*, this organization was formed at a meeting held in Chicago November 26, 1926, with representatives of the agricultural colleges of Alabama, Iowa, Missouri, New York, Ohio, Pennsylvania, and Tennessee in attendance. It is expected to hold annual meetings to consider problems confronting councils, clubs, and societies in these institutions dealing with student government and similar matters.

California Forest Experiment Station.—This station, located at the University of California, has begun operations with E. I. Kotok as director and a scientific staff of five other foresters. For the present its activities will be confined to the pine region and southern California watersheds, but later it will take up the problems of the redwood regions. Substations have been located at Devil's Canyon in the San Bernardino Mountains, Feather River on the Plumas National Forest, and Cow Creek on the Stanislaus National Forest, and at least two others and an experimental forest are contemplated.

Agricultural Education in South Africa.—The Department of Agriculture of the Union of South Africa is contemplating the establishment of a sub-

tropical experiment station and is seeking a suitable site. Orchard management is to be featured, together with pathological, entomological, and plant physiological studies. A part of the work will also be devoted to subtropical field crops, such as cotton, tobacco, and coffee, and to studies of the suitability of certain varieties of deciduous fruits for the low veld.

The department has definitely decided to establish a maize experiment station in the Orange Free State. A site has been selected near Kroonstad, and operations will be begun as soon as the property has been taken over.

The Government has decided to increase the number of agricultural scholarships for study overseas from 15 to 27. The new scholarships are valued at not to exceed £200 and include 4 in agricultural economics, 3 in sheep and wool, 2 in entomology, 2 in botany, and 1 in field husbandry.

A two-year diploma course at the Potchefstroom School of Agriculture was replaced January 1 by a one-year course. A year's practical experience on a farm is required for admission. The curriculum includes animal husbandry, poultry, field crops, veterinary science, horticulture, agricultural chemistry, agricultural engineering, agricultural economics and law, entomology, bookkeeping, and agricultural botany, as well as practical work in blacksmithing, saddlery, carpentry, and farm management. Short courses in eight lines are also offered. The school has a farm of about 2,800 acres, of which about one-fourth is under cultivation, as well as a ranch of about 4,000 acres.

Rubber Research Institute of Malaya.—This institute incorporated by the Legislature of the Federated Malay States has recently been established with G. Bryce as director. The institute is financed by Government funds, but is controlled by a board representing both the Government and the rubber growing industries. While its work will be primarily for the advancement of the rubber industry, it is realized that many fundamental questions of concern to tropical agriculture will necessarily be gone into. It is hoped that an early start may be made in chemical and physical work on soils, latex and preparation of rubber, plant nutrition and the physiology of growth, genetics, pathology, and statistical methods in field methods.

Fellowship for Textile Research.—A fellowship of $300 has been offered for the academic year 1927–28 by the American Home Economics Association through its committee on research. The work provided for is to be done at a college or university of recognized standing and under the direction of a member of the staff who has carried on textile research either personally or through students. Candidates are restricted to women holding at least one college or university degree and who have specialized in either textiles and in chemistry or in physics with some training in textiles. Applications close April 1, 1927. Additional information may be obtained from Miss Ruth O'Brien of the Bureau of Home Economics, U. S. Department of Agriculture.

New Journals.—*Entomologica Americana*, published by the Brooklyn Entomological Society, has resumed issue after an interval of 36 years. The intention is to utilize its columns for papers from authors not connected with institutions which publish the results of the research of their staffs, and which are too long or specialized for existing journals and too short for a book. The initial number consists of a thesis submitted for the D. Sc. degree at Radcliffe College by Priscilla B. Hussey and entitled Studies on the Pleuropodia of *Belostoma flumineum* Say and *Ranatra fusca* Palisot de Beauvois, with a Discussion of These Organs in Other Insects.

Western Dietitian, "a modern journal of dietetics and nutrition," is being issued monthly. The initial number contains several original articles, including What We Can Expect to Accomplish through Scientific Nutrition, by E. V.

McCollum; Sunlight and Nutrition, by R. E. Ramsay; Dietetic Value of the Avocado, by M. E. Jaffa; Acidosis, by W. D. Sansum; Isabel Bevier: Her Contribution to Home Economics, by H. B. Thompson; and How the New Science of Nutrition Has Revolutionized the Food Industries, by R. H. Shaw.

Boletín de los Servicios Agrícolas is being published quarterly by the Director General of the Agricultural Service of Chile. The initial number discusses the organization and work of the Department of Agriculture and Industry and presents contributions on The Economic Concept in National Agriculture, by J. Schneider Labbé; Paratyphoid in Hogs, by J. Descazeaux; and An Insect Injurious to Grapes, by C. E. Porter; together with economic data, statistics, news notes, decrees, etc.

Bulletin of Hygiene is being issued as a monthly by the Bureau of Hygiene and Tropical Diseases of Great Britain. It will consist of summaries and reviews of publications on all branches of public health and preventive medicine from the special point of view of overseas Britain. A section on hygiene in the Tropics will deal with publications in various languages, but the remainder of the journal will for the present be mainly restricted to publications in English. A feature of the initial number is the reproduction of numerous illustrations.

The Belgrade Economic Review is a monthly journal published in English and devoted to the economic, commercial, and industrial problems of the Kingdom of the Serbs, Croats, and Slovenes. The initial number contains among other material an article on Agricultural Credit in Jugoslavia, by M. K. Djordjević, and provisional statistics on the 1926 harvest of the chief crops in the Kingdom.

The North Western Naturalist is being issued quarterly as a scientific and educational journal for the district in Great Britain covered by Lancashire, Cheshire, Shropshire, Staffordshire, Derbyshire, North Wales, Cumberland, Westmorland, and the Isle of Man. The initial number contains several original articles, one of which deals with The Craneflies of Carnarvonshire, by H. F. Barnes.

Fortschritte der Landwirtschaft is being published semimonthly by the agricultural department of the High School for Soil Culture of Vienna and the Austrian Agricultural Experiment Stations. The initial number contains several original articles, as well as shorter contributions, abstracts, notes, etc.

The Economic Record has been established as a semiannual journal of the Economic Society of Australia and New Zealand. The initial number contains numerous original articles, reviews, and notes. Among the reviews is one entitled The Story of Australian Land Settlement, by H. Heaton.

Montana is to be issued by the State Department of Agriculture, Labor, and Industry six times per year. The initial number contains a large amount of data regarding the agricultural and other resources of the State. Subsequent issues are to be smaller in size and mainly statistical in scope.

Il Notiziario Chimico-Industriale is being published monthly at Turin, Italy, with a number of members of the staffs of Italian experiment stations on its corps of collaborators. The initial number contains several articles of agricultural interest, including one on the Preservation of Lemon Juice, by G. Romeo.

Farming in South Africa is being issued monthly by the Department of Agriculture, Union of South Africa. It is published primarily in the interests of the farmer, and consists largely of practical articles.

EXPERIMENT STATION RECORD

VOL. 56 FEBRUARY ABSTRACT NUMBER No. 3

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Colloid and capillary chemistry, H. FREUNDLICH, trans. by H. S. HATFIELD (*London: Methuen & Co., 1926, pp. XV+883, pls. 7, figs.* [*136*]).—This is a translation of the third German edition of this well-known text. A translation of the less technical abridged edition has been noted previously (E. S. R., 54, p. 407).

Textbook of microchemistry, F. EMICH (*Lehrbuch der Mikrochemie. Munich: J. F. Bergmann, 1926, 2. ed., rev., pp. XI+273, figs.* [*82*]).—A revision of the text previously noted (E. S. R., 29, p. 801).

Textbook of food chemistry, H. RÖTTGER (*Lehrbuch der Nahrungsmittel-Chemie. Leipzig: J. A. Barth, 1926, 5. ed., rev., vols. 1, pp. X+1028, insert pp. 8, pl. 1, figs. 27; 2, pp. VII+1029–2182, figs. 33*).—The fifth edition of this text, the third edition of which has been noted (E. S. R., 19, p. 669).

The essential oils, H. FINNEMORE (*London: Ernest Benn, 1926, pp. XV+880, pls. 11, fig. 1*).—An extensive compilation of information on the production, chemical constituents (with methods for their recognition), and uses of the essential oils classified according to their botanical sources.

Experiments on sunflower seed oil, H. E. FRENCH and H. O. HUMPHREY (*Missouri Univ. Engin. Expt. Sta. Bul. 25 (1926), pp. 27, figs. 6*).—The studies reported in this publication were undertaken to determine by comparison with other oils in general use the possible industrial uses of sunflower seed oil. The literature on the importation, domestic production, chemical composition, physical and chemical constants, and attempted uses of sunflower seed and oil is first reviewed. In the experimental work the oil used was pressed by two different companies from 11 samples of seed furnished by the Southeast Missouri Sunflower Growers Association. In attempts to remove the foots contained in the oil as it came from the mill, filtration through Filter-Cel or separation with a Sharples Super-Centrifuge proved most satisfactory. In tests with various bleaching agents, the best results were obtained with potassium hydroxide, followed by a mixture of fuller's earth and activated carbon.

The oil proved unsatisfactory as a frying oil on account of the low temperature at which it began to smoke and the characteristic disagreeable taste imparted to the product. Even steam distillation did not render the oil sufficiently tasteless to be acceptable as a salad oil. Partial hydrogenation of the purified and steam-distilled oil gave a product which proved satisfactory as a frying oil, but which was not satisfactory as a lard substitute.

The oil also proved unsatisfactory as a drying oil. It dried more slowly than linseed oil, and paints containing it possessed no superior weathering

qualities over linseed oil paints and darkened considerably on standing. A bibliography of 49 titles is appended.

On the chemical composition of poisonous beechnut cake, G. B. P. Van Kampen (*Een Onderzoek naar de Chemische Samenstelling van Vergiftige Beukenotenkoek. Proefschr., Tech. Hoogesch., Delft; Wageningen: H. Veenman & Sons,* [*1925*], *pp.* [7]+78, *pls. 4, fig. 1; Eng. abs., pp. 75–78*).—As a wartime measure in the Netherlands, attempts were made to use beechnut seed oil for human consumption and the resulting beechnut cake for animal feeding. The latter had been considered harmless to cows, pigs, and sheep, but harmful to horses. Several cases of intoxication in cows fed the cake during 1919 were reported, as a result of which this investigation was undertaken to determine the nature of the poisonous constituents.

The trouble was found to lie not so much in the presence of poisonous nitrogenous compounds as in decomposition products of the residual oil of the cake. There were identified in the poisonous but not in the nonpoisonous cake azelaic acid, $COOH(CH_2)_7COOH$, and an unknown tribasic acid, $C_6H_7(COOH)_3$. The possibility of rendering the cake harmless by complete extraction of the oil is suggested.

An improved method for the preparation of wheat gliadin, M. J. Blish and R. M. Sandstedt (*Cereal Chem., 3* (*1926*), *No. 3, pp. 144–149*).—The method described is based upon the observation that "when crude gluten which has been dried in vacuo at 65 to 70° C. is ground to a powder and treated with N/100 to N/10 acetic acid, only gliadin is dispersed. The extract may be filtered water-clear, and the gliadin recovered by the addition of salt, or by neutralization with alkali. This furnishes a basis for preparing gliadin in quantity and of a high degree of purity. It is superior to the established method from the standpoint of economy (in time, expense, and alcohol) and simplicity of operations."

The antirachitic value of irradiated cholesterol.—VI, A separation into an active and an inactive fraction, A. F. Hess, M. Weinstock, and E. Sherman (*Jour. Biol. Chem., 70* (*1926*), *No. 1, pp. 123–127*).—By certain modifications of the technique employed in the previous study (E. S. R., 55, p. 594) of the fractionation of irradiated cholesterol, antirachitic activity has been demonstrated in the filtrate from the digitonin precipitate. The modification consisted in carrying out the separation of the cholesterol digitonide in an atmosphere of nitrogen, separating the fraction as rapidly as possible, and using curative rather than preventive tests. The active fraction constituted only about 4 to 5 per cent of the original amount of cholesterol.

It is pointed out that these results are comparable with those previously reported by Dubin and Funk (E. S. R., 53, p. 765) for cod-liver oil, thus furnishing a proof that the active constituent in cod-liver oil is closely similar to, if not identical with, that of irradiated cholesterol. Another analogy between the two was furnished by the separation from irradiated cholesterol by extraction with liquid ammonia of an active residue comprising somewhat less than 4 per cent of the original material. The separation of a similar fraction from cod-liver oil has been reported briefly by Koch, Cahan, and Gustavson.

The anti-rachitic properties of irradiated sterols, O. Rosenheim and T. A. Webster (*Biochem. Jour., 20* (*1926*), *No. 3, pp. 537–544, pl. 1*).—Further attempts at the concentration and possible isolation of the active fraction of irradiated cholesterol (E. S. R., 54, p. 195) are reported, with results conforming in many respects to those of Hess, Weinstock, and Sherman noted above. It was found that the activity of irradiated cholesterol could be considerably

increased by conducting the irradiation in the absence of oxygen, i. e., in an atmosphere of nitrogen. In attempts to separate the active substance from the digitonin precipitate, negative results were obtained with air-irradiated cholesterol and positive with the samples irradiated in nitrogen.

Cholesterol was successfully irradiated by exposure in a thin layer on a glass plate, covered with a thin quartz disk, to daylight for an entire summer month in which there were many days of bright sunshine.

Attempts to activate various cholesterol derivatives gave negative results except in the case of ergosterol and cholesteryl acetate and palmitate. Irradiated ergosterol was highly protective even in doses of 1 mg. It is concluded that only members of the three groups of protoplasmic sterols (sterols occuring in animal or plant tissue) can be activated, and that both the secondary alcohol group and the unsaturated carbon linkage contained in the sterol molecule must be intact for successful irradiation.

In connection with the feeding experiments in which the Sherman-Pappenheimer low phosphorus diet 84 was used, the observation was made that patent flour occasionally carries enough of the antirachitic factor to invalidate the experiment, but that this source of error can be obviated by extracting the flour with ether.

Fractionation of irradiated cholesterol, I, II (*Jour. Biol. Chem., 71 (1926), No. 1, pp. 213–233*).—Two papers are presented.

I. *Chemical observations*, M. J. Shear and B. Kramer (pp. 213–220).—On irradiating cholesterol, purified by repeated crystallization from hot acetone solution, in thin layers in air for 2 hours at a distance of 18 in. and recrystallizing the irradiated product, a small quantity of pale yellow oil was obtained which gave a marked positive reaction with aniline-hydrochloric acid. The process could be repeated a number of times. The yield of the oil, provisionally called U. V. oil of cholesterol, was about 5 per cent following irradiation for 1 hour at 18 in. and 10 per cent after 2 hours. About 40 per cent of the crude oil was not precipitable by digitonin. This fraction gave positive reactions with the aniline-hydrochloric acid, Liebermann-Burchard, and Salkowski tests and the Lifschütz reaction for oxycholesterol.

II. *Antirachitic potency of the fractions*, B. Kramer, M. J. Shear, and D. H. Shelling (pp. 221–233).—In this paper the antirachitic potency of the crude U. V. oil of cholesterol and the cholesterol-free oil obtained from it was tested by curative experiments with rats on the Steenbock rachitic diet 2965. With the authors' technique irradiated cholesterol, fed at a 0.01 per cent level, induced initial healing in 9 days in 3 out of 5 rats, showing that this amount was in the neighborhood of the minimum dose. As previously reported by Hess, Weinstock, and Sherman (see above), irradiated cholesterol lost its antirachitic potency following recrystallization. Crude U. V. oil of cholesterol when fed at a 0.1 per cent level brought about healing in only 2 cases out of 4, while at the same level cholesterol-free U. V. oil induced healing in all of the 6 cases tested. With 0.3 per cent of the U. V. oil, marked healing was obtained with both the crude and cholesterol-free oils. The cholesterol-free oil protected by cottonseed oil was found to retain its antirachitic potency after two months' storage.

Comparison between the pigeon and the rat methods of testing for antineuritic vitamin [trans. title], A. Seidell (*Bul. Soc. Chim. Biol.*, 8 (*1926*), *No. 7, pp. 746–750, figs. 2*).—This discussion of the choice of methods for determining vitamin B and the antineuritic vitamin is based upon a comparison of the effects obtained with rats as reported by Smith and Hendrick (E. S. R., 55,

centrate prepared as previously noted (E. S. R., 55, p. 609) with and without the addition of autoclaved yeast. In the rat experiments the basal diet was one supposedly adequate except for vitamin B, and in the pigeon experiments it was polished rice.

In both experiments the weight of the experimental animals was maintained after the addition of the yeast concentrate alone. In the rat experiments there was a growth response following the addition of autoclaved yeast, but in the pigeon experiments the autoclaved yeast was without effect. On the assumption that growth-promoting vitamin B is composed of the antineuritic vitamin and another constituent, in itself active or inactive as regards growth, the possibility is suggested that the rat needs both of these constituents and the pigeon only the antineuritic vitamin. If this is true, the pigeon, on account of its simpler needs, would seem to be the choice for determinations of the antineuritic vitamin, and the rat for vitamin B.

Note on colorimeter correction curves, S. L. Wright, jr. (*Jour. Biol. Chem., 71 (1926), No. 1, pp. 209–212, figs. 2*).—Marked variations in the colorimeter correction curves for sugar (Folin and Wu method) as reported by different workers are shown by curves calculated from the reported findings to give the correction in milligrams plotted against the apparent value as calculated by the ordinary method. These variations are thought to emphasize the necessity of individual calculation of a correction curve. Attention is also called to the high colorimetric correction required for creatinine determinations.

***The influence of sodium chloride on the colorimetric determinations of* pH,** L. B. Parsons and W. F. Douglas (*Jour. Bact., 12 (1926), No. 4, pp. 263–265*).—A study of the salt error of the sulfonphthalein series of indicators at 1, 2, and 3 M salt concentrations is reported. It is concluded that by subtracting 0.3 from the observed colorimetric pH value results may be obtained for solutions containing from 6 to 18 per cent salt which are in conformity with the electrometric data.

A rapid electrometric method for the measurement of hydrion concentration of flour-water suspensions, H. J. Denham and G. W. S. Blair (*Cereal Chem., 3 (1926), No. 3, pp. 158–162, figs. 2*).—The quinhydrone electrode is used in the method described. Although it is said to be possible to conduct the determination directly on flour-water mixtures of convenient dilution, it has been found preferable to use an extract prepared by shaking a mixture of 20 gm. of flour with 200 cc. conductivity water in a special flask of borosilicate glass for 5 minutes in a mechanical shaker and then centrifuging for 5 minutes, after which the clear supernatant liquid is poured into the electrode vessel. The quinhydrone electrode has proved satisfactory over the entire range of pH occurring in flour extracts and has given results comparable with those obtained with the hydrogen electrode.

A rapid method for the colorimetric determination of hydrogen-ion concentration of crackers, R. T. Bohn and R. J. Martz (*Cereal Chem., 3 (1926), No. 3, pp. 183–187*).—This adaptation of the colorimetric method of determining the H-ion concentration of crackers as recommended by Johnson and Bailey (E. S. R., 54, p. 108) consists essentially in distributing several drops of distilled water across the freshly broken surface of the cracker, placing on them drops of water or an alcohol solution of phenol red, and comparing the color with a standard set of color tubes for this indicator. If the pH is near the limit of range of the indicator the test should be repeated with the next indicator in the series. Overbaked crackers should not be used for the test as they tend to show a lower alkalinity.

Control of diastatic activity in wheat flour. II. Experiments with flour

Chem., *3* (*1926*), *No. 3*, *pp. 163–182*, *figs. 3*).—This paper reports in detail experiments on a commercial scale confirming the conclusions drawn in the preliminary report (E. S. R., 55, p. 611). The baking strength of flour milled from wheat low in diastatic activity was increased by the addition of 3 per cent of sprouted kernels to the wheat. The time for proofing was reduced, the color of the crumb was whiter, and the crust of the loaves browner and more pleasing in appearance when the flour contained germinated wheat. The protein quality was apparently unaffected by the addition, and the aging of the flour proceeded normally. Examination of the flour after 26 months of storage showed it to be as sound as flour milled at the same time from ungerminated wheat.

The gasoline color value of several classes of wheat, D. A. Coleman and A. Christie (*Cereal Chem.*, *3* (*1926*), *No. 3*, *pp. 188–193*, *figs. 2*).—The method previously described (E. S. R., 55, p. 611) has been applied to several varieties of wheat and wheat flour.

The gasoline-soluble pigments varied greatly in amount with the different varieties. On the average the wheats of the hard red winter class contained the largest amount, followed by the common white class of wheat, and then by durum wheat. Certain varieties of durum wheat were consistently lower in gasoline-soluble pigments than others. No relationship was found between the protein and ash content of durum wheat flour and the gasoline-soluble pigments.

Miscibility tests in the detection of adulterated butter, H. J. Atkinson (*Canad. Chem. and Metall.*, *10* (*1926*), *No. 8*, *pp. 181–183*).—Attention is called to sources of error in various miscibility tests for the detection of adulteration of butter with other fats, and a new test is described which is based upon the principle of dissolving the fat in a given solvent and adding from a burette a liquid in which the buterfat but not the adulterant is immiscible. Ethyl acetoacetate was finally selected as the precipitant and benzene and chloroform as the solvents, two determinations being required, one with chloroform and the other with benzene. This was found necessary because a mixture of 72 per cent lard and 28 per cent coconut oil gives the same turbidity number as butterfat when benzene is used as the solvent, and a mixture of 90 per cent lard and 10 per cent coconut oil the same number as butterfat when chloroform is the solvent. The technique with benzene is as follows:

Into a clean, dry 50-cc. beaker about 4.2 cm. in diameter, 3 cc. of benzene is run from a burette and to this is added 2 cc. of melted butterfat at 30° C. After the mixture has reached room temperature ethyl acetoacetate is added from a burette, 1 cc. at a time, until slight traces of precipitation are noticeable, and then 0.2 or 0.3 cc. at a time at 1-minute intervals until a decided turbidity is reached, the number of cubic centimeters required being taken as the turbidity number.

In the course of the experimental work leading to the development of the method, the miscibility tests reported by Bills (E. S. R., 55, p. 610), were repeated with like results except in two instances. Pyridine was found to be immiscible with both butterfat and coconut oil and allyl aclohol immiscible with coconut oil.

Dehydration of fruits in California, A. W. Christie (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, *6* (*1927*), *No. 5*, *pp. 13–17*, *figs. 5*).—This is a general discussion of the relative advantages of sun drying and dehydration for preserving various California fruits, with data on the production of dried fruits in California in 1925. The highest figures were for raisins, totaling 219,300 tons,

Cultures and yeast foods tested for vinegar making (*Illinois Sta. Rpt. 1925, p. 149*).—In cider fermentations conducted by A. C. Vogele and F. W. Tanner simultaneously in 16-gal. kegs at 70° F., equally good results were obtained with uninoculated cider as with cider inoculated with pure cultures of yeast and acetic acid bacteria.

Low concentrations of ammonium acid phosphate and ammonium acetate (0.08 and 0.02 per cent respectively) added to the cider at the beginning of the experiment hastened the process, particularly the alcoholic fermentation, and did not detract from the clarity or fragrance of the product.

The use of water valves to exclude air from the fermenting liquid and thus prevent acetic acid formation until after the completion of the alcoholic fermentation was found to be of no advantage. The acetic acid fermentation was more rapid in kegs only one-half full than in those nearly full.

The effect of pickle scum on the pickle brine, M. A. Joslyn (*Fruit Prod. Jour. and Amer. Vinegar Indus., 6 (1927), No. 5, pp. 22, 23, figs. 3*).—The film frequently occuring on pickle brine has been found to contain a species of *Mycoderma vini*, a naturally-occurring soil organism. This aerobic organism has a marked destructive effect upon the lactic acid formed by bacterial action during the storage of pickles in brine. It is suggested that open tanks of pickles in brine be sealed with a layer of neutral mineral oil to prevent the growth of this organism.

A causative factor of "floaters" during the curing of olives, R. S. Alvarez (*Jour. Bact., 12 (1926), No. 5, pp. 359–365*).—A bacteriological examination of olives which had developed blisters (becoming floaters) during curing, as described by Cruess and Guthier (E. S. R., 50, p. 414), has shown that a group of organisms rather than a single species is probably responsible for the trouble. These organisms are described as rather large, Gram-negative rods, showing great pleomorphism. They are highly fermentative but do not liquefy gelatin, peptonize milk, or attack cellulose. Although closely allied to the colon bacillus they are not identical with it, for true coli on inoculation into olives do not produce floaters.

One of the organisms isolated was found to resist a temperature of 80° C. for 45 minutes, showing heat sterilization to be impracticable for destroying the organisms. Concentrations of salt solution above 5 per cent inhibited the growth, but a concentration of 10 per cent was necessary to kill the organisms. Of other alkalies the concentrations found necessary to sterilize broth cultures were commercial lye 0.2 per cent (pH 12.5), sodium hydroxide 0.4 per cent (pH 12.21), and potassium hydroxide 0.5 per cent (pH 12.26). Frequent thorough sterilization of the vats and curing of the olives at low temperatures are suggested as the best means of preventing spoilage. A brine-holding solution of at least 5 per cent, if not injurious, would probably minimize the danger of spoilage.

Methods of preserving sardines, H. R. Beard (*Canning Age, 7 (1926), No. 13, pp. 979–987, figs. 12*).—A description, with photographic illustrations, of the Maine, California, and foreign methods of canning sardines, together with a brief discussion of the reseach work of the U. S. Bureau of Fisheries on the advantages and disadvantages of the various methods now employed.

The principal tanning materials of Australia and their leather forming properties, M. B. Welch and F. A. Coombs ([*N. S. Wales*] *Technol. Mus. Bul. 10 (1926), pp. 20, pls. 7*).—A compilation, with references to the original literature, of information on the sources, availability, and tannin value of various Australian tanning materials. The most important of these is wattle bark.

METEOROLOGY

The high cost of weather, E. HUNTINGTON (*Amer. Rev. of Reviews, 75 (1927), No. 1, pp. 38–42*).—This article discusses briefly but broadly the effect of the weather of 1926 on crops, as illustrated particularly in wheat, cotton, apples, and corn. The loss of farm income due to unusual weather is estimated to have been $1,000,000,000 and other losses due to the same cause to have been $750,000,000. Weather conditions were favorable for large crops of cotton, winter wheat, and apples, but unfavorable for spring wheat and corn. There were unusually large crops, with low prices, of cotton and fruit.

The influence of weather factors on yield [trans. title], P. HOLDEFLEISS (*Kühn Arch., 9 (1925), pp. 53–78*).—On the basis of observations on temperature and precipitation at the meteorological station of the Agricultural Institute of the University of Halle, extending over a considerable period of years and correlated with crop yields, it is concluded that the yield of peas is favored by warm and dry weather in March and April and by rainy and cool weather in May and June. The yield of potatoes is determined to a large extent by a warm October of the preceding year, especially by the mean minimum of that month. The growth of pine shoots depends especially upon the precipitation of the previous year; to a less extent upon the character of the preceding winter and on the average temperature of the period from April to June. The yield of winter wheat (squarehead) is largely determined by the temperature in March, while cool weather in May and June is favorable. The yield of oats is especially favored by relative dryness in the months of January to March, inclusive, and the same is true of winter rye. Warm weather in March is without influence on winter rye.

Climates of California, R. J. RUSSELL (*Calif. Univ. Pubs. Geogr., 2 (1926), No. 4, pp. 73–84, pl. 1*).—This paper attempts to give "as full an areal analysis of California climates as present data warrant. . . . The classification followed, and to some extent adapted, is that of Wladimir Köppen." The climatic types are briefly described and regions are mapped.

Meteorological observations, [J. S. STEVENS] (*Maine Sta. Bul. 328 (1925), pp. 260, 261*).—Observations on temperature, precipitation, cloudiness, and wind at the University of Maine, Orono, during 1925 are summarized. The mean temperature for the year was 40.77° F., as compared with the 57-year mean of 42.775°. The precipitation was 47.31 in., as compared with the 57-year mean of 41.41 in. The number of clear days was 100.

Meteorological records, 1883–1925 (*New York State Sta. Rpt. 1926, pp. 57–69*).—Observations at the experiment station at Geneva, N. Y., on temperature, 1883–1925, and on precipitation, 1882–1925, are summarized in tables.

Climatology and meteorology of Pinheiro, State of Rio [trans. title], M. P. CAVALCANTI (*Rev. Zootech. e Vet. [Brazil], 12 (1926), No. 3, pp. 61–82, pls. 6*).—This article briefly discusses the meteorology and climatology of this region with special reference to agriculture, as well as the application of the climograph in the study of the climate.

Report for 1924 of the German Phenological Service [trans. title], E. WERTH (*Mitt. Biol. Reichsanst. Land u. Forstw. No. 28 (1926), pp. 338, figs. 3*).—Phenological observations for the year are reported in detail, with brief descriptions of the climatic and vegetation districts of Germany.

Meteorological observations, 1924–25 (*Guam Sta. Rpt. 1925, p. 20*).—A condensed summary of observations at the station on temperature, precipitation, and direction of the wind is given. "The year was characterized by

heavy rainfall during the rainy season, followed by a serious drought, beginning in January and extending until June. The drought was one of the most severe and prolonged since the establishment of the station."

SOILS—FERTILIZERS

Properties of the colloidal soil material, M. S. Anderson and S. Mattson (*U. S. Dept. Agr. Bul. 1452 (1926), pp. 47, figs. 4*).—The results of studies dealing with the properties of colloidal materials isolated from widely different soils are reported. Data are given on size of particles, specific gravity, adsorption of vapors, swelling, viscosity, volume of floc, adsorption of electrolytes, methylene blue required to render particles isoelectric, and H-ion concentration.

The different colloidal soil materials were found to vary considerably in all properties except specific gravity. A relationship between properties was indicated by the fact that variations of the colloids in one property usually paralleled variations in other properties. Variations in properties of the different colloids corresponded fairly closely to variations in the exchangeable bases and to variations in the $\frac{SiO_2}{Al_2O_3+Fe_2O_3}$ ratio. The correlation between the properties and the silica ratio probably does not mean that all properties of the colloid are chiefly governed by the silica ratio directly. Certain properties are evidently governed more directly by the kind or quantity of exchangeable bases than by the silica ratio. However, the exchangeable bases and the silica ratio are usually correlated.

Soil colloids appeared to be more lyophobe than lyophile in character, although they can not be looked upon as typical of either class. The importance of determining kind as well as quantity of colloid in a soil is pointed out. It is suggested that one or two properties, or the $\frac{SiO_2}{Al_2O_3+Fe_2O_3}$ ratio, would characterize the kind of colloidal material fairly well.

A list of 57 references to work bearing on the subject is included.

Do colloids exist as a coating around the soil grains? G. J. Bouyoucos (*Soil Sci., 21 (1926), No. 6, pp. 481–487*).—Studies conducted at the Michigan Experiment Station are reported which indicate that the colloids in the soil do not exist entirely as a coating around the soil grains but also as an independent component, either pure or containing different amounts of impurities and scattered irregularly throughout the soil mass. The experimental results and conclusions are strongly supported by a logical consideration of the form and amount of the colloids present in the soil. Optical examination of soils showed that they contain particles of sand and pebbles of various sizes which are not covered with colloidal gel. It was found that the material which passes through 200- and 325-mesh sieves is not clay. As a rule it contains less clay and colloids than the coarse material remaining behind.

The moisture equivalent of soils, M. D. Thomas and K. Harris (*Soil Sci., 21 (1926), No. 6, pp. 411–424, figs. 3*).—Studies conducted at the Utah Experiment Station of the moisture equivalent method as it is influenced by the amount of material centrifuged, by the texture and chemical treatment of the soil, and by the nature of the outside boundary are reported.

The results showed that increasing the size of sample reduces to a slight extent the amount of water retained in very coarse and very fine soils, whereas soils of intermediate texture show greater effects. The moisture gradient in the soil mass opposing the centrifugal force of the machine showed a similar maximum with intermediate textures. Very fine grained soils had a nearly

uniform moisture distribution at equilibrium. A period of many hours centrifuging was often required to establish capillary equilibrium in the case of heavy clays and very fine silts.

When samples of from 10 to 25 gm. were centrifuged, silt of about 10 μ average diameter retained more water than silt of 5 μ average diameter. This excess of water decreased with the increasing size of the sample. The very fine silts had a more apparent specific gravity than heavy clay, and also retained as much or more water. It is suggested that the capillaries in the silt which the centrifuge is unable to empty are filled entirely with water, whereas in the clay the corresponding interstices contain some colloidal material. As the capillaries of the outside boundary are reduced in size it was found that the adjacent soil becomes drier, and this reduction in the moisture content is reflected throughout the whole soil block. This effect conforms quantitatively to the thermodynamic theory of capillary equilibrium.

When the replaceable base of clay is entirely sodium the results indicate that the impermeability, and probably also the equilibrium moisture retaining power, are greater than when the replaceable base is potassium, ammonium, calcium, aluminum, or hydrogen. The colloidal swelling was found to be enhanced by the sodium in the complex.

Some soil and plant relationships, M. M. McCool and J. D. Romaine (*Soil Sci.*, *22* (*1926*), *No. 1, pp. 31–34*).—Studies conducted at the Michigan Experiment Station on the use of the heat of wetting method in studying the moisture relationships of soils and plants are briefly reported.

The nature of the plant materials seemed to affect the heat of wetting somewhat. The leaves of plants grown on unfertilized muck soil had a higher heat of wetting than those taken from differently fertilized soils, whereas plants grown on mineral soil gave similar but somewhat less striking results. Although fertilization did not affect the amount of heat evolved by alfalfa when moistened, it is considered apparent that the time of cutting and consequently the composition of the plant, does affect it.

Some effects of mulching paper on Hawaiian soils, G. R. Stewart, E. C. Thomas, and J. Horner (*Soil Sci.*, *22* (*1926*), *No. 1, pp. 35–59, figs. 6*).—Studies conducted at the experiment station of the Hawaiian Sugar Planters' Association are reported which showed that paper mulch exerts several effects upon Hawaiian soils planted to pineapples. Chief among these effects are a higher soil temperature, a higher content of soil moisture, and a more rapid elaboration of soil nutrients. The temperature effect of the paper mulch varied with the weather and with the season of the year, and it is thought probable that it will also vary with the degree of shading of the mulching paper by the pineapple plants.

The greatest increase in soil temperature due to mulching paper occurred in clear bright weather. Rain decreased the temperature differences between the mulched and the bare soil. In heavy rains the temperature differences disappeared, and for short periods the bare soil appeared to be slightly warmer. The maximum soil temperature occurred at from 2 to 4 p. m., about two hours after the maximum air temperature. The greatest differences between mulched and bare soils occurred during the warmest months of the year.

There was an appreciable effect of the paper mulch upon the retention of moisture in field soils, the mulched soils having a noticeably higher moisture content than the bare soils. A consistently higher nitrate content was found in paper mulched soils which had received no fertilizer, as well as in those receiving ammonium sulfate and a complete fertilizer mixture. This is taken to indicate that the paper mulch probably causes a more rapid elaboration of the principal soil nutrients.

Concentration of carbonates in two Minnesota soil types, P. R. McMiller (*Soil Sci., 22 (1926), No. 1, pp. 75–82, figs. 2*).—Studies conducted at the University of Minnesota are reported which showed that two important soil types in western Minnesota contain zones of pronounced carbonate accumulation at depths varying from 12 to 27 in., in which lime concretions are thickly distributed and in which the carbonate content ranges from 25.3 to 45.5 per cent. In the unaltered material below it varies from 7.7 to 22.7 per cent. No direct relation was found between the carbonate content and the fineness of texture of the subsoil. The color was distinctly grayer in the sections of carbonate concentration than in those above and below.

Contribution to the theory of the origin of alkali soils, A. A. J. de'Sigmond (*Soil Sci., 21 (1926), No. 6, pp. 455–479, figs. 3*).—This is a translation by S. A. Waksman of the results of studies on the origin of alkali soils, made with particular reference to Hungarian conditions. A summary of these findings leads to the statement that alkali soils may originate under arid and semiarid conditions where in the past there is in the soil a temporary abundance of humidity intersected by dry periods.

The soils of the glacial region of northwestern Ohio, G. W. Conrey (*Ohio Sta. Bimo. Bul., 11 (1926), No. 6, pp. 233–244, figs. 7*).—The results of a general survey of a region which includes a narrow belt bordering Lake Erie in northern and northeastern Ohio and a broad area in northwestern Ohio are briefly presented. The most striking topographic features of the region are the old beach ridges lying about the adjacent lake plain. These high-lying areas are well drained because of their gravelly nature. The level lake plain is practically flat, and was originally very poorly drained.

The soils of the region have resulted chiefly from the weathering of lake-laid and glacial deposits. The different soil series presented are briefly discussed.

The origin and nature of the soil organic matter or soil "humus."—I, Introductory and historical, S. A. Waksman (*Soil Sci., 22 (1926), No. 2, pp. 123–162*).—In a contribution from the New Jersey Experiment Stations a historical review of work on the subject is presented, together with a bibliography of 251 references.

The carbon-nitrogen ratio in soils and its relation to the decomposition of organic matter and nitrogen changes, S. Waterman (*Sci. Agr., 6 (1926), No. 10, pp. 357–359*).—Studies conducted at the Ontario Agricultural College are briefly reported which showed that the carbon-nitrogen ratio in ten soil samples analyzed had much wider variations than has previously been stated. A bibliography is appended.

Sweet clover in relation to the accumulation, loss, and conservation of nitrates in soil, A. L. Whiting and T. E. Richmond (*Soil Sci., 22 (1926), No. 1, pp. 1–19*).—Studies conducted by the Illinois Experiment Station are reported which showed that nitrification of both fall and spring plowed sweet clover proceeded rapidly, and to such an extent on one field as to furnish nitrate in excess of the requirements of a large corn crop. The spring plowed area was in better physical condition and required less labor in preparation than the fall plowed area. The rate of nitrification of sweet clover plowed in the spring at different dates prior to corn planting coincided closely with the date of plowing, that is, early plowing gave higher nitrate at an earlier date than later plowing. In two other fields all dates of plowing permitted a rapid nitrification and an accumulation sufficient to meet the needs of much larger crops than were produced.

Summer-plowed green sweet clover was found to nitrify rapidly, and large amounts of nitrates accumulated. Large losses resulted if no protective crop

was seeded. Oats and rye proved efficient in converting much nitrate into organic nitrogen and in reducing the amonnt formed, both of which redneed the losses. The oats was more valuable in reducing losses than the rye.

Studies on 13 Illinois experimental fields during a most disastrous season of rainfall are said to have demonstrated the importance of sweet clover in nitrogen economy.

Microorganisms concerned in the decomposition of celluloses in the soil, S. A. WAKSMAN and C. E. SKINNER (*Jour. Bact., 12 (1926), No. 1, pp. 57–84*).—Studies conducted at the New Jersey Experiment Stations are reported which show that fungi, aerobic bacteria, and anaerobic bacteria are the most important agents concerned in the decomposition of celluloses in the soil. The amount of cellulose which is decomposed in soil nnder aerobic conditions was found to be dependent upon the amount of available nitrogen. Under anaerobic conditions a much smaller amouut of nitrogen was required for the decomposition of the same amount of cellulose than under aerobic conditions. This is considered to be due to the much smaller amouut of energy liberated and utilized by the organisms decomposing cellulose under anaerobic conditions. The optimnm moisture concentration for the aerobic decomposition of cellulose was found to be two-thirds saturation to saturation.

Aerobic decomposition of cellnlose began very early when available nitrogen was present. Anaerobic decomposition began late, after a continued lag period, indicating that in normal soils organisms capable of decomposing cellulose under anaerobic conditions are not found in great abnndance.

The addition of cellulose to soils kept under aerobic conditions, especially in the presence of available nitrogen, cansed a very large increase in the nnmber and development of filamentous fungi.

There was a direct correlation between cellulose decomposition, development of fungi, and transformation of soluble nitrogen into microbial protoplasm. Most of the bacteria obtained from a soil in which cellulose decomposition took place were nnable to decompose cellnlose in pure culture. The elimination of fnngi from the soil by treatment with volatile antiseptics was found to prevent cellulose decomposition in that soil nnder aerobic conditions. Reinoculation of the partially sterilized soil brought about an extensive development of fungi and a rapid cellulose decomposition.

It was found that under anaerobic conditions both in the soil, in the straw heap, and in the manure pile bacteria are entirely concerned in the decomposition of cellulose. Aerobic bacteria were capable of decomposing cellnlose in the soil, and the opinion is expressed that they probably play an important part in this process in certain soils.

Some Actinomycetes were capable of decomposing celluloses, but they did not seem to play any direct part in this process in the soil itself. Their action was largely limited to the secondary prodncts, either liberated or synthesized, and to some constituents of natural organic substances.

The fact that nitrogen becomes a limiting factor in the decompostion of cellulose in the soil is taken to indicate that nitrogen-fixing bacteria probably do not increase the store of soil nitrogen under aerobic conditions, especially in humid soils, when celluloses and straw are added as sonrces of energy. Nitrogen fixation takes place, however, when starches and lower carbohydrates, which are available sources, are also introduced.

The conclusion is drawn that under aerobic conditions in humid soils fungi are largely concerned in the decomposition of celluloses, and that in arid and alkaline soils bacteria apparently play an important part in the decomposition of celluloses.

Profiles of peat deposits in New England, A. P. DACHNOWSKI (*Ecology, 7 (1926), No. 2, pp. 120–135, figs. 2*).—In a contribution from the U. S. D. A. Bureau of Plant Industry 12 profiles of peat deposits from New England and 1 from New Brunswick, Canada, are described and arranged in 4 series, based on the composition and position of the layers. The profiles in each series showed good agreement considering the distance apart and differences in topography, soils, and drainage. The profile records from Connecticut and Massachusetts represent the oldest peat areas in New England, and show two distinct wet periods and intervening dry periods. The profiles from Cornwall, Vt., and from Crystal and Lewiston, Me., record only one high water stage, followed by a drier period during which the ground waters receded. The profiles from Maine and Canada correspond so closely that it seems likely they record the same glacial substage.

Factors and problems in the selection of peat lands for different uses, A. P. DACHNOWSKI (*U. S. Dept. Agr. Bul. 1419 (1926), pp. 24, pls. 8, figs. 4*).—The chief hazards in the agriculture and industry of peat lands are grouped as (1) differences between peat lands in their distinctive structural framework, (2) lack of a proper method of controlling the supply of soil moisture, and (3) the accumulation in the root zone of crops of excessive quantities of soluble salts from the mineral subsoil. It is stated that these three difficulties may occur together or that any one of them may cause disastrous results. An effort is made to formulate a basis for a more definite selection, and also for a safer and more economic procedure in the work of improving peat lands which have been abandoned in various sections of the country.

[Soil studies at the Illinois Station] (*Illinois Sta. Rpt. 1925, pp. 6–31, figs. 5*).—The progress results of a large number of soil and soil fertility studies at the station are briefly summarized, and include data on weights of soil strata, the effect of long continued cropping and fertilization on soil properties, limes and liming practices, nitrogen, potash, and phosphoric acid fertilization practices, the residual effect of fertilizers, the sulfur content of rainfall, the use of straw as a fertilizer, and the use of clover in soil improvement.

Effect of different methods of fertilizer application on seed and seedling, A. B. BEAUMONT (*Amer. Fert., 65 (1926), No. 3, pp. 25, 26*).—Studies conducted at the Massachusetts Agricultural College are briefly reported which indicate that any method of application which allows the fertilizer to come into direct contact with the seed is detrimental to germination and stand.

Studies of certain physiological and chemical aspects of cereal straw (*New York State Sta. Rpt. 1926, p. 17*).—It is reported that a mixture of ammonium sulfate, acid phosphate, potassium chloride, and ground limestone was effective in rotting down straw in from three to four months. The process required frequent wetting and forking, and it is considered questionable if it is a practical one on any large scale.

Analyses of rainfall from a protected and an exposed gage for sulfur, nitrate nitrogen, and ammonia, E. M. JOHNSON, (*Jour. Amer. Soc. Agron., 17 (1925), No. 10, pp. 589–591*).—Studies conducted at the University of Kentucky are reported in which rainfall from a gauge protected from birds and from one not protected was analyzed for a period of 15 months for sulfur, nitrate, and ammonia. The total amount of sulfur in pounds per acre for the period was 56.07 in the rainfall from the protected gauge and 50.61 in that from the exposed gauge. The nitrate in the rainfall from the same period was 0.81 lb. per acre in the exposed gauge and 0.71 lb. in the protected gauge. There was a total of 17.44 lbs. per acre of ammonia in the water from the exposed gauge and 9.81 lbs. in that from the protected gauge.

The rate of absorption of nitrate of soda by oats and cotton when applied at different stages of plant growth, W. H. APPLETON and H. B. HELMS (*Jour. Amer. Soc. Agron., 17 (1925), No. 10, pp. 596–605*).—In studies conducted at the Alabama Experiment Station the results showed that when sodium nitrate was applied at the rate of 400 lbs. per acre to oats 14 days after planting, absorption of the nitrate was very slow for 3 weeks. After the third week the absorption increased, and all of the nitrate was absorbed by the close of the seventh week. When the nitrate was applied to oats at later stages of growth the rate of absorption was more rapid. Nitrate applied 42, 70, and 92 days after planting was completely absorbed in 20, 14, and 10 days, respectively. The nitrate of sodium nitrate applied at the rate of 600 lbs. per acre to cotton 14, 40, and 61 days after planting was completely absorbed in 36, 14, and 11 days, respectively. With both oats and cotton there was a close correlation between the rate of growth and the rate of nitrate absorption. The results of both experiments are taken to indicate that the loss of soluble nitrogenous fertilizers by leaching may be reduced by delaying the application until the crop will absorb it rapidly.

Potash: A review, estimate, and forecast, J. W. TURRENTINE (*New York: John Wiley & Sons; London: Chapman & Hall, 1926, pp. IX+188, figs. 16*).—This is a review of work which has been done on the industrial development of potash, particularly in this country. Estimates are made of the possible production from the different sources discussed.

The availability of phosphates in calcareous or alkaline soils, J. F. BREAZEALE and P. S. BURGESS (*Arizona Sta. Tech. Bul. 10 (1926), pp. 205–237, figs. 3*).—Studies are reported which showed that calcareous or alkaline soils in semiarid regions do not respond to applications of insoluble phosphates, although they do respond to soluble acid phosphates. Soils containing black alkali were found to contain no free carbon dioxide, so that the solvent action of carbon dioxide upon insoluble phosphates in such soils was absent.

Floats was found to be practically insoluble in water containing no carbon dioxide and containing an excess of calcium carbonate. Floats was also practically insoluble in a saturated solution of carbon dioxide with calcium carbonate or calcium bicarbonate. It showed an appreciable solubility in a saturated solution of carbon dioxide with calcium sulfate, but slightly lower than in the absence of calcium sulfate.

Influence of lime and phosphatic fertilizers on the phosphorus content of the soil solution and of soil extracts, F. W. PARKER and J. W. TIDMORE (*Soil Sci., 21 (1926), No. 6, pp. 425–441*).—Studies were conducted at the Alabama Experiment Station on soils from field experiments in Alabama, Illinois, Ohio, and Kentucky. The phosphatic fertilizers used included acid phosphate, rock phosphate, steamed bone meal, and basic slag.

Liming was found to increase the phosphorus content of the soil solution and of the extracts from soils receiving acid phosphate or basic slag. The influence of lime on the solubility of rock phosphate was not great, in some cases increasing and in others reducing it. Liming had a very decided depressing effect on the solubility of phosphorus in steamed bone meal.

The relation of the results obtained to the absorption of phosphorus by plants is discussed.

Influence of form, soil-zone, and fineness of lime and magnesia incorporations upon outgo of calcium and magnesium, W. H. MACINTIRE (*Soil Sci., 21 (1926), No. 5, pp. 377–391, figs. 3*).—The results of a 4-year lysimeter study conducted at the Tennessee Experiment Station to determine the influence of form, soil zone, and fineness of lime and magnesia incorporations upon calcium and magnesium losses from soils are reported.

The maximum increase in calcium loss from surface soil incorporations during 4 years was only 6.8 per cent of the addition, and although some influence of form and fineness of lime was noted, the losses tended to be uniform from the untreated subsoil. Lower zone incorporations gave a maximum increased loss of 33 per cent of the addition. Although hydrated lime gave the greatest loss during the first year, its final loss was almost identical with those from two finer limestone separates.

The losses from the high calcium additions during the first year were uniformly maximum, with decided decreases for the next three years for both zones. The differences due to fineness, zone, and time were not so great for the dolomite additions.

There was very little difference between the magnesium losses from the controls and those from either limestone or dolomite additions to surface soils. The losses from subsurface soil incorporations were consistently greater than those from the surface soil incorporations. Both zones generally gave the maximum annual losses during the first year. The influence of fineness of dolomite separates was especially marked in the subsurface soil losses for both annual and 4-year periods.

In the case of completely disintegrated finer limestone separates in the subsurface soils there was no increased magnesium loss from the decomposition of the magnesium content of the limestone. Repressed magnesium solubility was indicated by the high calcium additions to the lower zone. The total calcium-magnesium leachings from the surface soil incorporations were small and related to the degree of fineness.

The total calcium-magnesium leachings from the subsurface soil incorporations were uniformly greater than those from the surface soil incorporations. Limestone separates gave total losses uniformly higher than those from the corresponding dolomite separates, the disparity decreasing with increasing fineness. The total loss from calcium hydroxide and that from 100-mesh limestone and dolomite were almost identical.

Influence of form, soil-zone, and fineness of lime and magnesia incorporations upon outgo of sulfates and nitrates, W. H. MacIntire (*Soil Sci., 22 (1926), No. 1, pp. 21–30*).—Studies conducted at the Tennessee Experiment Station are reported which showed that the maximum increases in the average annual losses of sulfur and nitrogen by leaching from uncropped brown loam soil, treated with calcium and magnesium compounds and having a pH value of 6.38, were 5.8 and 18.8 lbs., respectively. Calcium hydroxide caused the greatest losses of sulfates from the surface soils. The finer separates of limestone and dolomite gave about the same results in this respect, and both caused greater losses than the coarser materials. The coarser separates had less effect than the finer on nitrate production, and these in turn caused greater nitrate losses than did calcium hydroxide. Each of the finer limestone separates was more active in this respect than the corresponding dolomite separate.

The influence of form and availability of treatment was not so consistent in increasing sulfate losses from the subsurface soils. Nine of the 10 limestone and dolomite separates caused greater nitrate losses than did calcium hydroxide from these soils. In this zone the influence of increase in surface of separates was not so marked, nor was the relationship between limestone and dolomite so well established.

As a whole, it appeared that neither degree of fineness of calcium hydroxide, limestone, and dolomite nor depth of incorporation consistently influenced the total losses of sulfates and nitrates during a 4-year period from this soil.

Fixation of calcium-magnesium from burnt limes, limestone, and dolomite incorporations in two soil zones, W. H. MacIntire and W. M. Shaw

(*Soil Sci., 22 (1926), No. 2, pp. 109–121, figs. 3*).—Studies conducted at the Tennessee Experiment Station on the fate of equivalent additions of calcium hydroxide, calcium and magnesium oxide mixtures, limestone, and dolomite in the surface and subsoils of a loam soil after four years of outdoor exposure are reported.

After extraction of the soluble salts the subsoil of the untreated soil showed an acidity in excess of that of the surface soil as a result of four years of leaching without cultivation.

The calcium-magnesium fixation, leachings, and carbonate residues from additions of calcium hydroxide and calcium oxide-magnesium oxide mixtures to surface soils were similar. Their fixations and losses did not differ greatly from those from limestone and dolomite. Similar results were obtained with subsoils.

In general the limestone separates were more extensively fixed than the dolomites, especially in the coarser materials. The differences between limestone and dolomite fixations were in general not so great as those between leachings and carbonate residues.

The ratios of fixation to loss for the 13 additions used were 14.6 : 1 for the surface soils and 2.29 : 1 for the subsoils. The supplementary effect of the untreated subsoils served to increase greatly the amount of calcium and magnesium fixed from surface soil additions of all the calcium materials. The lesser fixation of calcium and magnesium in the subsoils was reflected in a correlative increase in losses. The limestone separates were more extensively disintegrated in the subsoils, but with one exception the fixation from subsoil additions was less than that from additions to the surface soils. In the dolomite group the combination of greater disintegration and increased loss resulted in greater fixation from subsoil additions of calcium oxide and magnesium oxide and for all separates except one.

The results are taken to indicate that the coarser the separate the deeper should be the incorporation to insure disintegration, and that dolomite should be ground finer than limestone.

Synthetic calcium silicates as a source of agricultural lime.—II, A comparison of their influence with that of other forms of lime upon certain microbiological activities in the soil, R. M. Barnette (*Soil Sci., 21 (1926), No. 6, pp. 443–453, figs. 2*).—In a second contribution to the subject from the New Jersey Experiment Stations (E. S. R., 52, p. 818), studies are reported on the influence of several forms of lime, particularly calcium silicates, on the bacterial numbers, nitrate formation, and sulfate accumulation in several soils.

Chemically equivalent additions of ground limestone, of dicalcium silicate, and of calcium hydrate to soils deficient in basic materials increased the bacterial numbers in these soils in amounts varying with the forms and the soil. A rapid increase in the number of bacteria followed by a decrease to almost a constant number was observed after the addition of ground limestone, dicalcium silicate, and calcium hydrate.

Some correlation was obtained between the fertility of the soils under the various lime treatments and the number of bacteria. There was an increase in the formation of nitrates from ammonium sulfate with increasing applications of lime which could be correlated with increased crop yields. The final accumulations of unleached nitrates were the same regardless of the form of lime used and of the fact that different forms of lime had a varying influence on the rate of nitrate formation.

Two acid soils showed an increased sulfate formation with an increased application of lime, but a well limed soil showed very small increases of sulfate

with an increased lime addition. Chemically equivalent applications of four different kinds of lime affected the sulfate formation in the same manner in the three soils, producing substantially the same amount of sulfates.

The rapidity of the changes in the microbiological processes of the soil differed with the nature of the material, although the final effects of chemically equivalent quantities of the several liming materials were the same.

Relation of fineness of grinding to rate of sulfur oxidation in soils, R. E. Stephenson (*Soil Sci., 21 (1926), No. 6, pp. 489–494*).—Studies conducted at the Oregon Experiment Station are reported which showed that the more finely sulfur is ground the more rapidly it is oxidized, and that sulfur ground to pass a 40-mesh sieve should contain enough fine material to satisfy the most urgent needs for soil use. The oxidation of sulfur was found to increase acidity or to neutralize alkalinity in alkaline soils. The acid produced from oxidized sulfur brought calcium into solution rather freely.

Rabbit's foot oil and organic ammoniate fertilizer, G. P. Walton (*West. Rabbit Mag., 1 (1926), No. 8, pp. 5, 6, 9, 11–14, fig. 1*).—A chemical study by the U. S. D. A. Bureau of Soils of the offal produced in the commercial slaughter of rabbits bred for meat in southern California is reported.

The offal, which amounted to about 44 per cent of the live weight, was found to include three dissimilar types of material. The heads and feet contain, on the original moist basis, 2.6 per cent of nitrogen, the alimentary tracts 1 per cent, and the enteric contents 0.7 per cent.

The data show the possibility of obtaining yields of 22.3 per cent of tankage containing 7 per cent of nitrogen and 5.5 per cent of phosphoric acid from a given weight of the total offal.

Analyses of commercial fertilizers, H. E. Curtis, H. R. Allen, and L. Gault (*Kentucky Sta. Bul. 263 (1925), pp. 183–323*).—Guaranties and actual analyses of samples of 782 brands of fertilizers and fertilizer materials collected for inspection in Kentucky during 1925 are presented.

Commercial fertilizers (*Md. Univ. Quart. No. 118 (1926), pp. 32*).—Guaranties and actual analyses of 725 samples of fertilizers and fertilizer materials collected for inspection in Maryland during the period from January 1 to August 1, 1926, together with a summary of the 1925 tonnage records, are presented.

Report of analyses of commercial fertilizers sold in New York State, July 1, 1924, to June 30, 1925 (*N. Y. State Dept. Farms and Markets, Agr. Bul. 184 (1925), pp. 58*).—Guaranties and actual analyses of 652 samples of fertilizers and fertilizer materials and agricultural lime materials collected for inspection in New York during the period are presented.

Commercial fertilizers in 1925–26 and their uses, G. S. Fraps and S. E. Asbury (*Texas Sta. Bul. 346 (1926), pp. 3–58*).—This bulletin contains statistics regarding fertilizers sold in Texas during 1925–26, information regarding the fertilizer law, and guaranties and actual analyses of 899 samples of fertilizers and fertilizer materials collected for inspection in the State during the year. Information is also given on the proper use of fertilizers.

AGRICULTURAL BOTANY

The plant cuticle.—I, Its structure, distribution, and function, B. Lee and J. H. Priestley (*Ann. Bot. [London], 38 (1924), No. 151, pp. 525–545, figs. 12*).—The development, structure, and distribution of the cuticle have been studied with consideration of the fact that fats migrating from the protoplasts of both external and internal tissues may find their way to the walls during differentiation and along the walls to the surface, where they contribute to

the cuticle. The mobility of the fatty substances in the walls may be modified by external conditions which thus affect the thickness of the developing cuticle. This view is supported by an examination of cuticles on leafy shoots supplied with varying ratios of potassium to calcium. In submerged water plants a high potassium: calcium ratio produces a thin cuticle, supposedly because of leaching in the case of potassium soaps. Light and humidity affect cuticle thickness and consistency by the influence upon the oxidation and condensation of fatty acids. The cuticle influences evaporation rate and thereby the degree of condensation undergone by the cellulose wall. Cuticle resulting from chemical condensation in dry air is very resistant to stretching forces, as a result of which the condensation rate during cuticle development may affect the appearance of such epidermal outgrowths as hairs. It is suggested that the subsequent extension of parenchymatous tissues, such as the palisade parenchyma of the leaf mesophyll, may be affected in its direction by the resistance to stretching of the cuticular surface.

Experimental vegetation: The use of South African indigenous tree seedlings as phytometers, J. F. V. Phillips (*So. African Jour. Sci., 22 (1925), pp. 197–214*).—The present paper outlines preliminary investigations partly still in progress at the research station, Deepwalls, Knysna. An attempt was made to indicate the possibility of using certain South African native tree seedlings as phytometers, employing the growth response (height increment, fresh weight, dry weight, number of leaves, and leaf product increases) as measurements of either the whole environment or of certain of its factors, individually considered. Natural, free, and control phytometers are briefly defined, and examples are given of data yielded by experimental cultures of free, light-intensity control, and holard-percentage control phytometers. It is considered as likely that native tree seedlings, as knowledge of their life histories and requirements increases, will prove to be of value as phytometers in practical forestry.

Duration of light and growth, J. Adams (*Ann. Bot.* [*London*], *38 (1924), No. 151, pp. 509–523*).—In experimentation conducted with 16 species of plants, including wheat, rye, flax, hemp, soy bean, tomato, buckwheat, and sunflower, it was found that the rate of growth was more rapid at first in the plants receiving a diminished supply of light, but that those constantly exposed to daylight for a greater number of hours daily attained the greater height. It is deduced that the growth rate, whether in light or in darkness, depends on the amount of reserve material available for the formation of new tissue, and that, if two plants have the same supply of reserve material, the one grown in diminished light will make the more rapid growth while this reserve lasts. Plants grown under diminished light showed deficiency in mechanical tissue and a tendency to become decumbent, or, as in soy bean, to twine and to remain unbranched.

The effect of electrical illumination varied with cases. When the natural daylight period from December to March varied from 9 to 12 hours, the addition of an average nightly illumination of 9 hours with lamps varying from 100 to 300 watts showed a beneficial result in most cases, promoting growth rate and accelerating the time of blooming. As regards plants exposed to daylight for more than 12 hours daily from March to June, an average additional electrical illumination of from 5 to 6 hours nightly showed most effect in spring wheat, no acceleration of flowering time in buckwheat or tomato, and no flowering in soy bean. As compared with full daylight, electrical illumination of hemp retarded both height and weight. In tomato, soy bean, buckwheat, and hemp there appears to be an upper limit to the amount of light which a plant can utilize.

Respiration in plants [trans. title], M. Popoff (*Biol. Gen., 1 (1925), No. 1, pp. 159–162*).—Like the account previously noted (E. S. R., 53, p. 520), this deals comparatively with respiration in plants and in animals.

The relation of temperature to growth and respiration in the potato plant, J. Bushnell (*Minnesota Sta. Tech. Bul. 34 (1925), pp. 3–29, figs. 12*).—A review of literature relating to potato yields is said to have shown that the optimum temperature for tuber yield is about 17° C. (62.6° F.), and that yields decrease rapidly with an increase of temperature.

The author investigated the effect of a range of temperatures above the optimum by growing potato plants in thermoregulated chambers set to operate at 20, 23, 26, and 29°. The plants showed conspicuous responses in the leaves and in the tubers, both decreasing in size with increase in temperature. At 29° no tubers formed. The maximum temperature for tuber growth under the conditions of the author's experiments was between 26 and 29°. Respiration during the night in the above-ground part of the plant increased with temperature. The carbohydrate content of leaves and stems, sampled at both sunset and sunrise, was not appreciably affected by this range of temperature. Reduction in the carbohydrate available for translocation, which resulted from the increased respiration at the higher temperatures, roughly corresponded to reduction in tuber growth. Thus the rate of tuber growth appeared to be a function of the available carbohydrate.

From the data of his experiments, as well as evidence from the literature, the author suggests that deficiency of carbohydrate arising from excessive respiration may be very generally the limiting factor in plant growth at temperatures above the optimum.

Absorption and exudation pressures of sap in plants, D. T. MacDougal (*Amer. Phil. Soc. Proc., 64 (1925), No. 2, pp. 102–130, figs. 6*).—"Previous studies [E. S. R., 53, pp. 517, 624] have identified the reversible variations in diameter of tree trunks with changes in cohesion tension of the water column in the recently formed wood, and similar variations also take place in herbaceous stems. Daily changes of diameter of succulent plant bodies such as those of the cacti have been seen to follow a different program and to be due to variations in the water deficit in the succulent cortex, which may be many centimeters in thickness.

"The present paper [particular conclusions from which are detailed] presents some studies on nature of negative absorption pressures and of bleeding exudation pressures in plants based upon studies in hydration, water deficit, permeability, and colloidal reactions of cell masses in such succulent plants. Both absorption and exudation phenomena are demonstrated to be due to localized causes. Cell masses abutting on bore holes in stems have been induced to show absorption or exudation pressures at the will of the experimenter. The possibility of the participation of root action or 'root pressures' is not disproved, but on the other hand no positive evidence for such participation has been brought to light in these experiments. Intake of water by empty vessels or tracheids is registered as 'negative' pressures on manometers attached to stumps of stems, or in any manner which connects the instrument with spaces containing gases at less than atmospheric pressure. The capillary intake of water implied is not to be confused with the satisfaction of living cell masses by osmotic absorption or hydration of cell colloids. Both absorption and exudation pressures as measured by a manometer attached to bore holes filled with water in stems are traumatic phenomena. Their measurement, however, yields results of great value in determining osmotic values, water deficit, and permeability of the tissues."

The absorption of salts by storage tissues, W. STILES (*Ann. Bot. [London]*, *38* (*1924*), *No. 152*, *pp. 617–633*, *figs. 4*).—"These findings indicate that the absorption of salt by storage tissues can not be a simple process of diffusion of salt through a cell membrane. As this assumption underlies measurements of salt intake and of cell permeability made by the plasmolytic methods, conclusions with regard to these questions based on results obtained by plasmolytic methods should be confirmed by other methods or disregarded."

The absorption of ions by citrus and walnut seedlings, A. R. C. HAAS and H. S. REED (*Hilgardia [California Sta.]*, *2* (*1926*), *No. 4*, *pp. 67–106*, *figs. 9*).—A discussion is given of experiments on the exchange of ions between solutions and citrus and walnut seedlings as connected with certain problems of their nutrition.

Rough lemon and grapefruit seedlings are said to have removed relatively more potassium than calcium from solutions containing approximately equivalent amounts of these ions. When the potassium in the culture solution was low in amount, citrus seedlings absorbed more calcium, magnesium and phosphate from the solution than when potassium was abundant. An interchange of ions was observed between the solution and roots, which resulted in an increase in excretion of potassium in the solutions when the original concentration of potassium was low. Citrus seedlings absorbed more cation than anion from solutions of single calcium salts, causing an increase in the acidity of the solutions. Calcium ions were readily absorbed when sodium and potassium were absent or low in amount. The presence of chlorine ions reduced the absorption of nitrate ions by citrus seedlings. When various chlorides were added to culture solutions the greatest amount of chlorine was absorbed from those containing calcium chloride.

The changes in reaction of culture solutions in which citrus seedlings have been grown are attributed directly to differential absorption of ions, together with an excretion of certain ions. Acid culture solutions were not always found to change in the direction of neutrality, nor did neutral solutions always change in the direction of greater acidity. The authors claim that in complete nutrient solutions citrus seedlings may, in a comparatively short period, bring about so great a concentration of H ions as to be injurious to the roots. Bicarbonate ions were found in culture solutions from which citrus roots had removed nitrate ions. No stimulation of growth of citrus roots was found to occur in solutions of sodium carbonate. When calcium was completely absent from the solution a high initial alkalinity due to sodium carbonate proved very injurious to the roots of citrus seedlings. The complete absence of calcium from a culture solution containing favorable amounts of other essential ions was also injurious.

The authors believe that the nature of the growth obtained with citrus seedlings in water cultures at different pH values depends not only upon the maintained pH of the solution, but also upon the pH of the original solution as well as upon the nature of the acid or alkali used in maintaining the desired reaction.

Although the ash of walnut kernels was found to contain approximately 60 per cent of phosphate, the walnut seedlings rapidly absorbed all the phosphate from a complete nutrient solution. They removed less chlorine or sulfate than potassium from culture solutions containing an excess of potassium salt. When grown in solutions having equivalent concentrations of potassium chloride or potassium sulfate, walnut seedlings removed practically the same amount of calcium from both solutions. Although slightly more potassium was absorbed from the potassium sulfate culture, the absorption of sulfate exceeded that of

chlorine. Except in the case of potassium nitrate, the potassium absorbed by walnut seedlings from a nutrient solution to which different potassium salts were added always exceeded that of the anion added with it. The total amount of magnesium absorbed by walnut seedlings was found to be quite constant and was not affected appreciably by additions of potassium salts to the solution.

Walnut seedlings are said to have removed more cation than anion from solutions of single calcium salts, except in the case of the nitrate. The acidity of the residual solution was entirely dependent upon the absorption rate of the two ions employed. The addition of the chlorides or sulfates of sodium or potassium to calcium solutions brought a reduction in the absorption of calcium. The addition of potassium chloride or sulfate to calcium nitrate caused a final reaction more acid than the initial reaction, although when calcium nitrate alone was used walnut seedlings brought about a decrease in acidity. The presence of an excess of sodium chloride in a culture solution prevented walnut seedlings from absorbing large amounts of calcium. Increasing the concentration of the nutrient solution containing large amounts of sodium chloride caused no substantial differences in the amounts of sodium and chlorine ions absorbed by walnut seedlings. The apical portion of walnut roots grown in calcium-free solutions contained more calcium than the portions further removed from the apex, although the first evidences of injury were visible in this apical portion.

Testing corn stalks chemically to aid in determining their plant food needs, G. N. HOFFER (*Indiana Sta. Bul. 298 (1926), pp. 31, pls. 2, figs. 15*).—A description is given of a method for recognizing the deficiencies in the soil of nutrients essential for the proper growth of the corn plant. The method is based upon the color reaction of the cut surface of mature cornstalks to solutions of diphenylamine, potassium thiocyanate, and hydrochloric acid. A lack of nitrogen or potash in the soil is indicated by the tests. As a rule, plants of stunted growth not responding to tests for nitrogen or potash are said to be suffering from a lack of phosphorus. A key is given for the interpretation of the results of the test.

Some observations on the nitrate-reducing properties of plants, V. L. ANDERSON (*Ann. Bot.* [*London*], *38 (1924), No. 152, pp. 699–706*).—Nitrate occurs frequently in plants, the amount varying with growth conditions, but not constantly with species. A nitrate-reducing mechanism, termed atite, is claimed to have been found in 23 plants. The atite of potato is a thermolabile and oxidizable substance, which, under the conditions of the experiment, can convert only a limited amount of nitrate to nitrite. Acetaldehyde may affect the activity of the atite of different plants in different ways, possibly more than a single mechanism being involved. Nitrite was found in more than 20 per cent of the plants examined. The evidence does not indicate that atite is of much significance in the protein metabolism of the plant.

The formation of plant growth-promoting substances by micro-organisms, F. A. MOCKERIDGE (*Ann. Bot.* [*London*], *38 (1924), No. 152, pp. 723–734*).—The effect of varying quantities of nucleic acid derivatives on the growth of *Lemna minor* was investigated, and it was found that the effect obtained was approximately proportional to the quantity of material supplied. Examination was also made of the effect of varying proportions of a sterilized culture of Azotobacter, as a result of which it appears that the effect, though increasing with the quantity of the organism supplied, is not proportional. Both autolyzed and autoclaved yeast were examined and both were found to have a plant growth-promoting influence, more particularly the autoclaved material.

The growth-promoting effect of the bacteria used may be due to one or more of the nucleic acid radicals present or to some other substance, but all materials

so far found to have this effect on plant growth also contained these purine and pyrimidine bases.

The root-tubercles in Arbutus unedo, M. F. RIVETT (*Ann. Bot.* [*London*], *38* (*1924*), *No. 152, pp. 661–677, figs. 14*).—The root tubercles of *A. unedo* are shown to be the arrested secondary and successive laterals of the season's growth. The arrest of growth is due to invasion by a fungus, first as a rampant ectotroph and subsequently as an endotroph in the peripheral cells. The invasion of the fungus is limited by the digestive action of the host cells of the tubercle, which may be regarded as phagocytes. Apparently the interchange of food materials between host and endophyte is very slight, affording no permanent mutual benefit. The relationship is regarded as one of balanced parasitism, the action of the tubercles being effective in conferring a degree of immunity on the root system as a whole.

The staling of fungal cultures.—I, General and chemical investigation of staling by Fusarium. II, The alkaline metabolic products and their effect on the growth of fungal spores, C. A. PRATT (*Ann. Bot.* [*London*], *38* (*1924*), *Nos. 151, pp. 563–595, fig. 1; 152, pp. 599–615, fig. 1*).—Literature on the subject of the staling of fungi in culture is surveyed. *Fusarium* sp. was grown on Richards' solution and the staleness examined by the Botrytis germ-tube method. The results are detailed.

"The growth of Botrytis spores is affected by the addition to the fresh medium of various organic compounds which have been demonstrated in the stale medium. Alcohols and acetaldehyde are toxic only at high concentrations; they can play a very small part, if any, in 'staling.' Simple organic acids are toxic at sufficiently low concentrations to be responsible for the poor germinative capacity of the acidified stale medium. A graph is given in which the toxic effects of a number of organic acids are compared."

Organic acid radicals do not reduce the growth of Botrytis spores if the medium be made alkaline. They can not, therefore, act as staling agents in an alkaline stale medium. A study of the effect on the growth of fungal spores of the alkaline metabolic products has led to the conclusion that the small quantities of ammonia produced are probably ineffective, but that bicarbonates, potassium, and, in a lesser degree, ammonium are capable of inhibiting Botrytis growth when present in amounts even smaller than those found in the stale medium. It is suggested that staling is in general due to the formation of bicarbonate by the carbon dioxide of respiration whenever the medium is such that a basic radical is set free.

On the theory of "age and area," S. SCHONLAND (*Ann. Bot.* [*London*], *38* (*1924*), *No. 151, pp. 453–472*).—A critical review is given of the age and area theory and related contributions.

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The neurogenic theory of karyokinesis [trans. title], M. MÜHLMANN (*Ztschr. Wiss. Biol., Abt. B, Ztschr. Zellforsch. u. Mikros. Anat.*, *3* (*1926*), *No. 2, pp. 377–382, fig. 1*).—The author presents evidence in support of the theory that the centrosome acts as the central nervous control of the cell during division.

A cytological investigation of some species and species hybrids within the genus Saccharum, G. BREMER (*Genetica* [*The Hague*], *5* (*1923*), *Nos. 2, pp. 97–148, figs. 52; 3–4, pp. 273–326, figs. 40*).—This is an English translation of the account previously noted from another source (E. S. R., 49, p. 822).

The cytology of the sugarcane, G. BREMER (*Genetica* [*The Hague*], *6* (*1924*) *No. 6, pp. 497–525, figs. 20*).—The fact, brought out in the first part of this inves-

tigation above noted, that the original forms of Saccharum have different chromosome numbers is considered to be a fact of importance in the division of that genus into species. This second part, considering the cytology of some cultivated varieties of sugar cane and presenting relevant facts in considerable detail, presents in conclusion the view that there exists in all probability in sugar cane a relation between regular or irregular reduction division and fertility. Both are supposedly influenced strongly by unfavorable growth conditions.

Hereditary doubling suggesting anomalous chromatin distribution in the mouse, C. H. Danforth (*Soc. Expt. Biol. and Med. Proc., 23 (1925), No. 2, pp. 145–147*).—Anomalous individuals, ranging in degree from Y-shaped specimens with 4 hind legs and 2 tails to those with a slight degree of doubling in the external genitalia, have been produced in 2 strains of mice at Stanford University. One of the strains has produced as high as 12 per cent, and in certain selected matings 20 per cent of these individuals were produced. Only 1 mating between 2 abnormal individuals has been successful, but sibs and parents have been used for breeding. The peculiar condition appears to be hereditary, but can not be explained on the basis of 1 or 2 dominant, recessive, or cumulative genes.

Since a differential factor favoring the production and function of normal gametes in heterozygous individuals gives closer agreement with the observed data, it is suggested that the reduplication of a certain amount of chromatin material is involved.

A genetic and cytological study of dwarfing in wheat and oats, C. H. Goulden (*Minnesota Sta. Tech. Bul. 33 (1926), pp. 3–37, pls. 3, figs. 4*).—The segregation in F_2 and F_3 in a Kota-Marquis cross (E. S. R., 49, p. 841) and in a Chul-Marquis cross (made and studied first at the University of Saskatchewan by W. P. Thompson) indicated that two factors, a dominant dwarf *D* and an inhibitor *I* were involved. Back crosses of true breeding dwarfs gave proof of the presence of an inhibiting factor in the Kota and Chul parents which prevents the expression of a dwarf factor.

Cytological study led to conclusion that in the Kota-Marquis dwarfs chromosome number and behavior are as normal as in the parental material. In the Chul-Marquis dwarfs lagging chromosomes were present in most of the cells undergoing reduction division. It was suggested that the lagging chromosomes may have resulted from the presence in the heterotypic division of three homologous chromosomes which formed trivalents and allowed the remaining chromosome to lag behind. Such cells might arise through irregular pairing of the chromosomes in the mother cells of the F_1 plants and the recombination of the aberrant gametes so formed. Irregularities of this type affecting the chromosome pairs carrying the dwarf factor or factors and the inhibitor would result in the occurrence in F_3 of families showing a segregation varying from 3:1 of normals to dwarfs to practically all normals, which would easily account for ratios approximating 63:1.

Dwarf oats found in the progeny of plants heterozygous for the false wild character had about one-half the height of normal plants, were completely sterile, and always possessed the false wild character. The progeny of normal plants heterozygous for the false wild factor usually consist of a 1:2:1 ratio of false wild, intermediate, and cultivated individuals, but when dwarfs occur in families from such plants the cultivated class is practically eliminated and the remainder consists of false wild dwarfs and intermediate normals in a 1:1 ratio. Cytological study of the pollen mother cells of the oats dwarf showed reduction division to be extremely irregular. An almost complete lack of coordination among the chromosomes at the heterotype was apparent, and

the homotype probably did not take place. Very few normal appearing pollen grains were formed. In the case of the oats dwarf a close correlation evidently existed between dwarfing, the false wild character, cytological irregularities, and complete sterility. Chromosome counts gave 42 for *Avena sativa*, *A. fatua*, *A. sterilis*, and *A. nuda*, and 14 for *A. brevis*, *A. barbata*, and *A. strigosa*.

Quadruple allelomorphs affecting eye color in Habrobracon, A. R. WHITING and R. H. BURTON (*Amer. Nat., 60 (1926), No. 668, pp. 285–290*).—In further studies of inheritance of orange-eyed character in the parasitic wasp (E. S. R., 46, p. 463) evidence is presented which indicates the existence of a series of quadruple allelomorphs, black (O), light (o^l), orange (o), and ivory (o^i), in decreasing order of dominance.

Two wing mutations in Habrobracon and their method of inheritance, P. W. WHITING (*Amer. Nat., 60 (1926), No. 670, pp. 443–454, fig. 1*).—The origin and genetic relationships of two mutations, designated as wrinkled wings (w) and reduced wings (r), in the parasitic wasp (*H. juglandis*) are discussed. Both mutations are recessive or nearly so and are inherited independently, neither showing linkage with the orange eye factor or with the main factor causing the defect in the wing vein r_5.

The occurrence of pigmented facets in white eyes in Drosophila melanogaster, W. P. SPENCER (*Amer. Nat., 60 (1926), No. 668, pp. 282–285*).—The occurrence of single pigmented facets in one or both eyes of white-eyed flies has been observed in as many as 53 per cent of the individuals in certain cultures. This condition appears to be inherited, but not as a simple recessive character unless environmental or genetic modifying factors mask the effect. Flies having several colored facets in both eyes did not produce a greater percentage of flies with colored facets than other matings of flies having smaller numbers of colored facets.

The marking of black-spotted Holstein cattle and its inheritance [trans. title], E. LAUPRECHT (*Ztschr. Induktive Abstam. u. Vererbungslehre, 40 (1926), No. 3, pp. 139–196, figs. 24*).—The author has studied the variations in color patterns in three old established herds of Holsteins, and by comparing the regions of black markings on the different individuals has concluded that there are six centers of black pigmentation, all of which may be separated or run in together, i. e., (1) eye and cheek, (2) ear and neck, (3) side of the neck, (4) upper arm or shoulder, (5) side of the body near the last rib, and (6) rump spots. In certain cases the individual spot may be broken up into several parts, this occurring most frequently in the center of the pigmentation on the side of the body. In the animals having smaller amounts of black the pigment first disappears from the shoulder, then from the side, and finally from the rump. The forelegs were colored more often than the hind legs, and a tabulation showed that the right legs were more often colored than the left. The total amount of area colored as estimated by cross section paper was independent of the sex, but in one herd there was more black on the females than on the males. Tabulations indicated that the total amount of color was correlated with the amount of pigmentation in the various centers for black on the different parts of the body.

In studying the variation and distribution of color, the animals were classified under five groups, but since few were allotted to the groups with the smaller amounts of black, three classes, designated as light, medium, and dark, were taken into account in studying the inheritance of color pattern. Crosses of the various types produced offspring classified in all three groups, which generally averaged intermediate between the two kinds. In light ×

light crosses or dark × dark crosses, offspring of the opposite extreme were not obtained in either case.

A single pair of factors is suggested in explaining the inheritance of the amount of color. Homozygous individuals of the two sorts form the dark and light classes, respectively, and heterozygotes form the intermediate class, since much larger numbers were found in the latter group. Modifying factors are also operative, but very good agreement to the above hypothesis was obtained in the offspring in the three herds, and also when the records of other investigators on this subject were studied.

Inheritance of horns, wattles, and color in grade Toggenburg goats, J. L. LUSH (*Jour. Heredity, 17 (1926), No. 3, pp. 73–91, figs. 4*).—The results of studies of the inheritance of horns, wattles, and color in matings of Toggenburg bucks with does produced by grading up Mexican does with Toggenburg bucks at the Texas Experiment Station are reported.

The data on the inheritance of horns accumulated during three years agreed with the hypothesis that the polled condition is dominant, with the possible exception of one kid from horned parents which was recorded as probably not horned and which died young. The horns were better developed in males than in females, but the presence or absence of the condition was not sex linked or associated with sex.

The 3 years' matings dealing with the inheritance of wattles agreed with the hypothesis that wattles are due to a single dominant Mendelian factor except for 3 wattled kids which were produced by nonwattled parents. These cases, however, were otherwise explained. A study of the data indicates that the factor for wattles is not linked with sex or with the horned character. The simple explanation for wattles in goats did not appear to fit the inheritance of wattles in the station flock of Karakul sheep.

An analysis of the inheritance of black, white, and roan color, dorsal stripe, Toggenburg pattern, and spotting was attempted from the same matings by determining Yule's coefficient of association between the color of the dam and the color of the offspring. All of the correlations, except white spotting, indicated a strong tendency for kids to resemble their dams in color, but definite modes of inheritance were not determined. Solid white appeared to be epistatic to most of the other colors. Black and extensive white spotting also tended to be epistatic.

Genetic analysis of temperament of rats, M. P. SADOVNIKOVA-KOLTZOVA (*Jour. Expt. Zool., 45 (1926), No. 1, pp. 301–318, figs. 8*).—The ability of 123 rats, all descendants of a cross of a wild gray rat and a white laboratory rat, to run a maze showed considerable variability, the curve having three chief peaks. It was further found that the time required by individuals in certain families differed significantly from the time required by individuals of other families, but it did not appear to be influenced by teaching the parents. It is suggested from the analysis that three genes are involved in the inheritance of this ability, one for general activity, one for emotion, and one for the seeking instinct.

These studies were conducted at the Institute of Experimental Biology at Moscow.

Abnormal sexuality in animals.—I, Genotypical, F. A. E. CREW (*Quart. Rev. Biol., 1 (1926), No. 3, pp. 315–359, figs. 14*).—This is a discussion of the genetics of intersexuality and gynandromorphism in animals and insects, based mainly on the investigations of Morgan, Goldschmidt, and Crew.

Offspring from immature females hampered (*Illinois Sta. Rpt. 1925, p. 88*).—In studies with mice the offspring from immature females were found by G. A. Lindsey and E. Roberts to be significantly smaller at weaning than

the offspring of more mature females. This difference became less as the offspring became older, indicating that nourishment was probably the limiting factor.

Heredity involved in hairlessness of animals (*Illinois Sta. Rpt. 1925, p. 59*).—Studies by E. Roberts of the inheritance of hairlessness in rats have indicated that this condition is due to a single factor recessive to the normal.

Hyperglycaemia as a Mendelian recessive character in mice, P. J. Cammidge and H. A. H. Howard (*Jour. Genetics, 16 (1926), No. 3, pp. 387–392*).—In studies of the sugar content of the blood of animals it has been found that after a 12- to 24-hour fast the sugars rarely varied more than 5 mg. from an average of 85 mg. per 100 cc. of blood, although certain individuals occasionally differed by as much as 25 mg.

By making suitable crosses with mice it was found that the tendency for a high blood sugar content was clearly and definitely inherited as a simple recessive Mendelian character. Two individuals having 116 and 120 mg., respectively, of sugar per 100 cc. of blood produced seven offspring with blood sugar varying from 114 to 124 mg. In three crosses of hyperglycemic individuals with normals the offspring all contained normal amounts of blood sugar. Three back-cross matings of heterozygotes with hyperglycemic individuals produced offspring which were practically equally divided between normals and hyperglycemics. The ratio was practically 3:1 in the offspring of three matings of heterozygotes × heterozygotes.

Genetic studies on the nature of cancer, L. C. Strong (*Amer. Nat., 60 (1926), No. 668, pp. 201–226*).—The author discusses the results of his studies previously noted (E. S. R., 55, p. 731), dealing with the inheritance of a susceptibility to cancer transplantation in mice, in connection with the results of other investigations from which fundamental conceptions of the nature of transplantable tumor tissue are brought out. The transplantable tumor appears to be controlled by the constitution of the cells and maintains a definite reactive capacity for a number of generations. Genetic changes in the constitution of the cells may occur sporadically at any time, changing to a greater or less degree the characteristics of the cells, as has occurred in the origin of the cancer.

A genetic study of the growth of a transplantable tumor (adenocarcinoma, dBrB), L. C. Strong (*Jour. Expt. Zool., 45 (1926), No. 1, pp. 231–253, figs. 6*).—A more complete account of investigations noted above.

The question of xenia occurrence in horticultural plants [trans. title], G. Östermann (*Angew. Bot., 6 (1924), No. 2, pp. 232–242, figs. 2*).—Phenomena connected with crossings of apple and of pear varieties are detailed.

An experimental study on xenia in the domestic fowl, S. Kopeć (*Jour. Genetics, 16 (1926), No. 3, pp. 269–286, figs. 3*).—Studies of the occurrence of xenia in hens' eggs are reported from the Government Institute for Agricultural Research, Pulawy, Poland, based on color records classified according to 13 grades for 487 eggs laid by 5 Leghorn hens mated with an Orpington cock, 3 eggs laid by 4 Leghorn hens injected with testicles from Orpington roosters, 0 eggs laid by 2 unmated Leghorns, 308 laid by 2 Orpington hens mated with Leghorn cock, 591 eggs laid by 5 Orpington hens injected with testicles from Leghorn roosters, 428 eggs laid by 2 unmated Orpington hens, 218 eggs from F_1 hens (Orpington ♀ × Leghorn ♂), and 857 eggs from 10 F_1 (Leghorn × Orpington ♂).

The results showed that considerable seasonal variation occurred in the color of the eggs of either breed when unmated or when mated with cocks of the opposite breed. The average color intensities decreased from spring to

autumn and increased in the winter, but no significant differences were observed in the colors of the eggs laid by either breed when mated with roosters of the opposite breed or when unmated. It is noted that one very dark egg occurred among those laid by a Leghorn hen which had been injected with Orpington testicles, though others nearly as dark were laid by the controls. The color of the eggs of the F_1s was generally intermediate between the eggs of the two breeds.

Previous observations on the occurrence of xenia in fowls are discussed, from which it is concluded that the earlier work has not taken into account the normal seasonal variation in egg color.

An experimental study on the appearance of xenia in the domestic fowl [trans. title], S. KOPEĆ (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Pulawach* (*Mém. Inst. Natl. Polon. Écon. Rurale Pulawy*, 6 (1925), A, pp. 23–59, figs. 2; *Eng. abs.*, pp. 54–59).—Essentially noted above.

The ovarian follicular hormone: A study of variation in pig, cow, and human ovaries, E. ALLEN (*Soc. Expt. Biol. and Med. Proc.*, 23 (1926), No. 5, pp. 383–387).—This paper reports the results of a comparative study of the amount of follicular hormone present in the sow, cow, and human ovaries at various stages of the oestrous cycle. The measurements of the amounts of the hormone present were made in terms of rat units, i. e., the amount required to produce the changes in the vagina of a spayed female which are characteristic of the oestrous period.

Tests were made of the ovaries of two sows. One sow was killed just as the external signs of sexual activity were appearing, when 9 large follicles were found in one ovary and 8 in the other. The second sow was killed on the second day following the appearance of the external signs of heat, which was after ovulation had occurred. Eleven corpora lutea of the first to the second day in development had formed in one ovary, and one corpus luteum in the other. The results showed that the 2 ovaries of the first animal contained a total of 28 rat units of hormone, while the 2 ovaries of the other sow contained less than 2.1 units.

Available ovaries from cows were divided into 5 groups, corresponding to the different stages of follicular development, and were similarly tested. Twenty-six ovaries taken at oestrum contained an average of 4.6 rat units of the hormone per pair, which thus must represent the average amount of the hormone in 1 large follicle 1 to 2 days before ovulation. Extracts of the ovaries from several animals at all other stages of the cycle gave negative results, even though there were from 8 to 11 corpora lutea present in each of the groups.

The largest amount of the hormone recovered from human liquor folliculi has been 7 rat units per cubic centimeter and from a human corpus luteum 3.7 rat units per cubic centimeter of luteal tissue. The latter amount was recovered during the third week following the first day of menstruation.

It is pointed out that the cow and pig showed a wide variation in the amount of hormone present at different stages of the oestrous cycle, while in the human there is a considerable amount present in the corpus luteum as well as in the liquor folliculi. These differences are discussed in connection with the differences which have been observed between the menstrual cycle of primates and the oestrous cycle of the cow and sow.

Standardization of preparations of ovarian follicular hormone, E. P. BUGBEE and A. E. SIMOND (*Endocrinology*, 10 (1926), No. 2, pp. 191–200).—In working on the measurement of the strength of the follicular hormone it has been found that the dose should vary directly with the weight of the rat.

it not being necessary to have rats weighing approximately 140 gm., as the potency is computed by the rat units of Allen (see above) by multiplying the finding with larger rats by the weight of the rat divided by 140 gm. Rats of any age may be used, provided they have reached sexual maturity and have not passed the prime of life.

The time of ovulation in the menstrual cycle of the monkey, Macacus rhesus, E. ALLEN (*Soc. Expt. Biol. and Med. Proc., 23 (1926), No. 5, pp. 381–383*).—A tubal ovum has been recovered from two different monkeys in experiments at the University of Missouri. The one was recovered on the fourteenth day after menses, while the other was recovered on the tenth day of the cycle. These results, taken in conjunction with the one other known case of the recovery of a tubal ovum in the monkey, place the time of ovulation between the tenth and fourteenth days of the menstrual cycle.

Alcohol and the sex ratio in mice, C. H. DANFORTH (*Soc. Expt. Biol. and Med. Proc., 23 (1926), No. 4, pp. 305–308*).—In three experiments at Stanford University male mice were exposed twice daily to alcohol fumes for one hour, and the effects on the sex ratio of the young produced by these males when mated after one week's treatment were determined. The sex ratios among the offspring of the alcoholized males in the first, second, and third experiments were 178.9, 153.1, and 117.9 males, respectively, per 100 females. There were no controls in the first experiment, but in the second and third tests the sex ratios of the controls were 104.8, and 100.4 males per 100 females. It is pointed out that the difference is more than 3 times the probable error in the second experiment and 2.7 times in the third. The author concludes that all the available data dealing with the effect of alcoholization on sex ratio in mice point toward an increased percentage of males.

FIELD CROPS

Artificial plats for field experiments, T. L. LYON and E. W. LELAND (*Jour. Amer. Soc. Agron., 18 (1926), No. 7, pp. 596–602, figs. 5*).—The construction, uses, and advantages of artificial plats for field experiments adopted at the New York Cornell Experiment Station to avoid variations in soil productivity are described and illustrated.

A census of an acre of corn (by sampling), F. L. ENGLEDOW (*Jour. Agr. Sci. [England], 16 (1926), No. 2, pp. 166–195, figs. 3*).—The nature and prevalence of gradations of interplant spacings in field crops and the relation between spacing and acre yield and plant development were investigated, employing Yeoman wheat on clay and Little Joss wheat on gravel soil. Systems of sampling an acre of grain are depicted and explained, with comments on the influence of seeding method, soil condition, seed quality, and damage agencies on plant development.

Plant development and yield per unit area showed well-defined relationships to spacing as represented by 5 aggregate grades of 1–8, 9–10, 11–12, 13–16, and 17–24 plants of Little Joss per foot. Comparison of the 1-spike, 2-spike, etc., plants showed that in tillering, from origin to spike formation and as affected by spacing, lay a prime determiner of cropping capacity. The yield from any unit length of drill is apparently affected by the populousness of adjoining and adjacent units.

Grazing periods and forage production on the national forests, A. W. SAMPSON and H. E. MALMSTEN (*U. S. Dept. Agr. Bul. 1405 (1926), pp. 55, pls. 6, figs. 18*).—Observations at the Great Basin Experiment Station and in other parts of the Wasatch Mountains of Utah were made to determine when the

range is ready for grazing, the intensity and frequency of grazing permitted, how to handle the stock, and the natural revegetation of the range.

The proper development of the later maturing herbaceous and browse species, and especially the important forage plants, seem to offer a safe index to range readiness. This stage may be identified by height, size, or flower stalk, or head production, depending on the species. The grasses, for instance, should in general be about 6 in. in height, and the earlier maturing ones should show flower stalks. The best grazing seasons in the central Wasatch region were found to be oak-brush zone (6,500- to 8,000-ft. elevation), May 20 to June 9 and October 1 to 15; aspen-fir (7,500 to 9,500 ft.), June 10 to July 9 and October 1 to 15; and spruce-fir (above 9,000 ft.), July 10 to September 30.

Frequent and close cropping seemed quite detrimental to both herbaceous and browse species and conducive to impoverishment of the soil and to increased run-off and erosion. It appeared of the greatest importance that the animals be excluded from the range until the forage is developed enough to be of good food value. Cropping resulting in reduced aerial growth is reflected in the root development, in the quantity of food stored in the underground parts, and in the production of a correspondingly small quantity of herbage the following season. The grasses are indicated as of primary value as forage plants since they withstand grazing better than most other vegetation. Artificial reseedings of the plains and the drier foothills to cultivated forage plants were without practical results, whereas the possibilities were considerably greater on mountain meadows and other favorable sites. Cropping a pasture each year to the maximum of its forage production sooner or later causes a sharp decline in its grazing capacity.

Improvement and maintenance of native pasture lands, the forage on which is largely bunch grasses, depends upon the periodical production of a fertile seed crop. To insure seed production of the more palatable forage plants requires prevention of too early grazing, avoidance of overgrazing, and effective control and distribution of stock. Deferred and rotation grazing, which imply withholding part of the range from grazing until after seed maturity each year, have given conspicuous results in range reseeding. Revegetation on the range was practically as rapid where deferred grazing was practiced as where the lands were protected yearlong from foraging animals.

[Agronomic experiments in Guam, 1925], J. Guerrero (*Guam Sta. Rpt. 1925, pp. 9–15, figs. 6*).—In continued investigations (E. S. R., 55, p. 131), *Paspalum dilatatum* with roots spaced 6 by 6 in. covered the ground within 30 days and required a single cultivation, whereas 18 by 18 in. spacing required 90 days and three cultivations. The close planting is too costly except under intensive culture. Napier grass and Guatemala grass surpassed Merker grass, *Pennisetum setosum*, and Japanese cane in order in drought resistance. In fertilizer tests Guatemala grass made its best yields when limed only, while Napier grass and Japanese cane responded best to lime with manure. Molasses grass has suppressed Johnson grass and made good forage yields.

The behavior of varieties of alfalfa and kudzu and *Tephrosia* spp. and the relative efficiency of varieties of velvet beans, cowpeas, and mung beans, and Patani and Lima beans, pigeon peas, and *Tephrosia* spp. for cover crops are briefly described. The New Era pigeon pea required more care before it could suppress weed growth, but it occupied the land much longer than other legumes.

One-half lb. caustic soda and 1 lb. white arsenic were dissolved in boiling water; after adding 1 pint pine tar the solution was boiled slowly for about

15 minutes and diluted with 3 gal. water. A pint of the preparation poured into notches cut around the trunks of aroma (*Acacia farnesiana*) killed 50 per cent of the shrubs, and one-half pint applied to newly sprouted stumps killed 75 per cent of the plants so treated. A 4-oz. application of carbon disulfide poured into shallow holes in the ground immediately surrounding the trunks killed 25 per cent of the lot treated, but lighter applications or formalin, carbolic acid, and sulfuric acid similarly applied resulted negatively.

On newly broken grasslands, variously treated, barnyard manure gave the highest yield of both grain and forage, a limed plat followed, and a sulfur-treated plat ranked third in grain yield but fourth in forage. Although the green manure plat produced the least forage, it made more grain than the untreated check. Corn, cowpeas, and velvet beans each produced much more grain and forage in rotations than in continuous culture.

Nancy Hall and Pumpkin led the imported sweet potato varieties, which in general decidedly outyielded the native sorts. The greatest weight of roots of Porto Rico were produced where acid phosphate and manure in combination were applied. Varieties of yams, trellised, made increases ranging from 54 to 400 per cent in root yields per acre over untrellised yams.

[Field crops experiments in Illinois] (*Illinois Sta. Rpt. 1925, pp. 39–43, 48–55, figs. 4*).—After 28 years of selection, continued by C. M. Woodworth and F. L. Winter, the protein content of corn has attained 16.6 per cent in the high protein strain, or an increase of 5.68 per cent. The low protein strain has decreased from 10.92 to 8.38 per cent in protein. The original oil content, 4.7 per cent, rose to 9.86 per cent in the high oil strain and dropped to 1.51 per cent in the low oil strain. Ears on the original strain of Leaming corn were borne at a height of 49.6 in. but have been raised to 92.9 in. in the high strain and lowered to 11.7 in. in the low strain. The original percentage of 2-eared stalks, 6.7 per cent, has been increased to as high as 85 per cent, although results are variable.

Using Reid Yellow Dent as a standard, W. L. Burlison and G. H. Dungan found the 2-ear strain to have a percentage rating of 109.4 and the Leaming High Yield 108.3. The 2-ear strain probably will be found more useful for fodder or silage than for grain. The chinch bug resistant types of corn, Champion White Pearl, Democrat, Black Hawk, and Mohawk, ranked the highest on the Alhambra (Madison County) field.

Results to date indicated to Burlison, B. Koehler, and Dungan that corn selected after it is well dented is as good from the standpoint of productivity as seed corn selected when completely mature. Since corn left to mature on the stalk is often injured by freezing, harvesting of seed corn while in the dent stage seems a sound practice. Several types of cabinets and incubators on the market appeared promising to J. C. Hackleman for seed corn germination after certain alterations. Considering the limited capacity, the cost, and the danger of damaging a good egg incubator, it seems preferable to build a special cabinet.

Tests by R. W. Stark continued to demonstrate that hard red Crimean wheats, such as Turkey and Kanred, withstand the winters of central and northern Illinois better than soft wheats. Soft wheats, such as Fulcaster, Red Cross, Illini Chief, and Fultz, proved suitable to southern Illinois. Baking tests showed that Turkey Red and strains and hybrids of that variety produce the strongest flour, while flour from the soft wheats is more suitable for biscuits and pastry. Marquis and Illinois No. 1 spring wheats have made fair records in variety tests at Urbana and De Kalb and seem well adapted to central and northern Illinois. Wisconsin Pedigree and Oderbrucker have been the highest yielding barleys.

According to Burlison and Dungan, early oats are somewhat better adapted to Illinois conditions than late varieties. Iowa has the highest average yield during 4 years at De Kalb. Iowa 103 led in average yields during its 9 years at the station and also during 6 years at Alhambra.

In small grain breeding studies Woodworth and Winter found that winter rye plants vary in self-fertility or self-sterility, although rye has been considered practically self-sterile. Counts on wheat increase plats showed scab infection to range from 6 to 27 per cent. In studies of the resistance of different wheat varieties to Hessian fly, Red Russian showed 32.3 per cent infestation as compared to only 13.4 per cent for Dawson Golden Chaff.

Marked increases in the yield of potatoes were obtained by J. Pieper and W. P. Flint by using northern-grown seed of an adapted variety, and also by spraying the vines with an insecticide for chewing insects, together with a fungicide which repels some insects and also controls potato leaf diseases. Irish Cobbler and Early Ohio have been the highest yielding early varieties, while Rural New Yorker and Carmen No. 3 were the best late varieties.

Studies on the number of nodes of culms in barley, wheat, and rice plants [trans. title], M. Yamasaki (*Nôgaku Kwaihô (Jour. Sci. Agr. Soc. [Japan], No. 278 (1926), pp. 1–35, pl. 1, figs. 4; abs. in Japan. Jour. Bot., 3 (1926), No. 2, pp. (40), (41)*).—In one of the two kinds of culms distinguished in barley and wheat, the insertion part of the spike constitutes a ridge which goes around the rachis (*N*-culm), while in the other the ridge goes only half way round (*T*-culm). On the basis of teratological as well as anatomical evidence, the author concludes that the *T*-culm is produced by the formation of an extra culm-internode of which the apex (where the spikelet is inserted) has the half-way ridge, and which is not developed in the *N*-culm. That the *T*-culm averages one more internode than the *N*-culm was confirmed by observations on 58 races of barley and 86 of wheat. The relative number of *T*- and *N*-culms in each race is naturally more or less variable, although in general the number of *T*-culms is smaller than that of *N*-culms. The better nutrition, greater moisture, and higher temperature appear to lead to the increase of *T*-culms. Similar phenomena were recognizable in the rice plant.

The preservation of the pollen of cereals [trans. title], T. Sasaki (*Nôgaku Kwaihô (Jour. Sci. Agr. Soc. [Japan], No. 275 (1925), pp. 259–287; Eng. abs., pp. 10, 11)*).—Pollination experiments by the author during 6 years demonstrated that 40 per cent relative humidity is optimum for the preservation of barley pollen, 50 per cent for corn pollen, and 20 or 40 per cent for the pollen of peas. The duration of germinability of the pollen was not always the same as that of fertilizing power.

[Experiments with legumes in Illinois] (*Illinois Sta. Rpt. 1925, pp. 31, 32, 37–39*).—Kudzu, an acid-resistant legume, can not be used on sour soils of Illinois, according to W. L. Burlison and J. Pieper. Ladino clover, however, is very promising, and Cherokee clover, lespedeza, dalea, and velvet beans merit further tests. Wild white clover from England resembles the American common white clover but does not grow as well.

Burlison and G. H. Dungan found the variegated or Grimm types of alfalfa to excel in winter hardiness at the station and at De Kalb. South Dakota No. 12 alfalfa seemed to be about as winter resistant as the Grimm and Cossack varieties and the common Kansas grown alfalfa to be intermediate in winter resistance, whereas the Argentine variety has frozen out badly. Spring seeding continued to give best results under northern Illinois conditions.

Results obtained during 5 years by Burlison and Pieper with alsike clover at De Kalb showed that the average seed yield fluctuated from 3.3 to 1.21 bu. per acre, and the average yields of hay ranged from 2.57 to 1.76 tons per

acre. Phosphatic fertilizer increased the seed yield 18 per cent and the hay yield 6 per cent.

Burlison, Dungan, and W. P. Flint obtained the following average acre seed yield over 3 years from red clover: Clipped twice (spring) 0.41 bu., clipped once (spring) 0.45 bu., hay crop removed 1.59 bu., and first crop harvested for seed 0.73 bu. Hay yields obtained under the different systems of handling the crop were in line with those reported earlier. When the first crop was used for hay and the second for seed, acre hay yields averaged about 1.5 tons air-dry, and more than 3 tons when both crops were used for hay.

Alfalfa and red-clover seed tests (*U. S. Dept. Agr., Rpt. Sec. Agr. 1926, pp. 64, 65*).—Available results from trials in cooperation with State experiment stations have shown alfalfa seed from Turkestan to be of little value for most of the United States, particularly in those humid sections where alfalfa is important. South African seed produces plants not hardy enough for the Northern States, and in most tests plants from Argentina seed suffered seriously over the first and second winters.

Three general regions are distinguished in regard to the adaptability of red clover, i. e., (1) where severe winters prevail, (2) with milder winters and where anthracnose or other clover diseases are unimportant, and (3) with milder winters and where anthracnose or other clover diseases are of major importance. Clover from domestic seed, including that grown in Canada, resists severe winters better than any foreign clover so far tested, and in regions of severe winters only American-grown clover seed should be used. Seed of disease-resistant types of domestic clover should be used if possible where anthracnose or similar diseases prevail.

Alfalfa seed production in southern Idaho, A. E. McClymonds (*Idaho Sta. Bul. 143 (1926), pp. 3–20, figs. 7*).—Based on experiments at the Aberdeen Substation and experience in that region, information is given for the profitable production of alfalfa seed in southern Idaho. The discussion deals with varieties, preparation, cultural, irrigation, and harvesting practices, influence of the weather, and insect and weed pests and their control.

Effect of immaturity on shrinkage, shelling percentage, and germination of seed corn, H. W. Alberts (*Jour. Amer. Soc. Agron., 18 (1926), No. 7, pp. 603, 604*).—The effect of harvesting corn at five different stages of maturity on shrinkage, shelling percentage, and germination was studied at the Wisconsin Experiment Station, using Golden Glow in 1919, and Murdock in 1920. The percentage of shrinkage decreased progressively from the early milk to the full dent stage in both varieties, whereas the shelling and germination percentages rose up to the beginning-glaze stage. There was little difference between the beginning of the glaze stage and the full-dent stage in shelling percentage or in germination.

Summary of experiments on the manuring of mangels, 1892–1925, E. J. Roberts (*Univ. Col. No. Wales, Bangor, Dept. Agr.* [*Pub.*], *1925, No. 1, pp. 11*).—Experiments by the University College of North Wales and the Counties of Anglesey, Carnarvonshire, Denbighshire, and Flintshire demonstrated farmyard manure to be essential to the production of a large crop of mangels. The average acre increase accruing from a dressing of 10 or 15 tons per acre at 41 centers was 9.28 tons. On land receiving only 10 tons of manure per acre an extra 10 tons produced an average increase of 3.7 tons over 25 centers but proved unprofitable in conjunction with a dressing of a complete fertilizer. An application of 128 lbs. of sodium nitrate, 349 lbs. of superphosphate, and 82 lbs. of potassium chloride used along with manure averaged as effective as a fertiliser application twice as large at 35 centers.

Considering the average of all the trials, potassium fertilizers showed only a moderate return, although in some cases a very decided and profitable response was had. Kainit was superior unit for unit to potassium sulfate and flue dust. Nitrogenous fertilizers showed a small return in tests from 1909 to 1913, inclusive, probably because most of the trials were conducted on soils already with large nitrogen reserves assembled by wild white clover of the previous meadow. Sodium nitrate proved superior to ammonium sulfate in trials at 35 centers, the average superiority being 1.4 tons per acre or 8 per cent. In a series from 1921 to 1925, no appreciable difference was seen between the effect of ammonium chloride and ammonium sulfate, while sodium nitrate surpassed both slightly. Common salt resulted in considerable and profitable crop increase when no potassium was used, but when added to a 448-lb. dressing of kainit its effect was small.

The influence of external conditions on the blooming of rice flowers [trans. title], Y. KOBAYASI (*Nôgaku Kwaihô* (*Jour. Sci. Agr. Soc.* [*Japan*], *No. 279* (*1926*), *pp. 59–72, figs. 7; abs. in Japan. Jour. Bot., 3* (*1926*), *No. 2, p.* (*31*)).—Studies of the effect of sunlight and darkness on the rice flowers gave indications that while blooming was noticeably retarded in darkness, the number of opening flowers was not reduced significantly. However, dehiscence of anthers, pollen shedding, and percentage of fertilization were not interfered with. The author observed that orange light, followed by yellow, accelerated blooming most, and that the process was also speeded by electrical illumination.

[Investigations with soy beans in Illinois] (*Illinois Sta. Rpt. 1925, pp. 32–37, fig. 1*).—In the soy bean variety tests by J. C. Hackleman, Manchu led in seed yields and averaged 28.6 bu. of seed per acre for the period 1921–1924. Hong Kong led as a hay producing bean with a 5-year acre average of 2.62 tons. O. H. Sears found additional evidence that certain varieties of soy beans seem less susceptible to nodule bacterial infection than some other sorts. Soil acidity appeared to be an important factor controlling the longevity of the soy bean nodule bacteria even upon slightly acid soils. The effect of both limestone and inoculation on the growth and composition of soy beans was found to be similar in the field to those obtained in the greenhouse.

A study by Sears on the influence of soy beans upon other crops in the rotation indicates to date that a close relationship exists between the nitrogen cycle and this problem. In the 4-year rotation of corn, oats, red clover, wheat, and a catch crop of sweet clover, soy beans are substituted when the red clover fails. For a number of experiment fields on brown silt loam and black clay loam wheat yields after clover exceeded those after soy beans, the gain in favor of clover ranging from 2.9 bu. of wheat an acre without soil treatment up to 6.7 bu. when the land received residues, limestone, and phosphate. In the station rotation of corn, corn, corn, and soy beans, corn after soy beans has outyielded corn following corn, the increase in favor of soy beans ranging from 6.8 bu. when the land received manure and phosphate up to 11.7 bu. with manure alone.

In breeding the soy bean for oil content, C. M. Woodworth has found individual parent plants of any particular line to give progenies with the same mean oil content, even though the parents differ by as much as 4 per cent, making selection within such lines for high or low oil seem noneffective. Some lines isolated had an average oil content as low as 15 per cent. In a method devised, the extent of mottling of seeds on a given plant can be expressed by a single figure. Although the plants of a given progeny varied considerably, significant differences were found between progenies. The amount of mottling is apparently determined to some extent at least by the genetic constitution.

Influence of adjacent rows of soybeans on one another, R. J. GARBER and T. E. ODLAND (*Jour. Amer. Soc. Agron., 18 (1926), No. 7, pp. 605–607*).—At the West Virginia Experiment Station, each soy bean variety is grown in 18-ft. rows 30 in. apart in 4 or more systematically distributed 4-row plats and after discarding 1 ft. from the end of each of the 2 inner rows the remainder of one is used for obtaining seed yield and the remainder of the other for forage yield. Studies of the heights and yields of the ordinarily discarded border rows showed no appreciable effect of height or yield of one row upon the yield of an adjacent row. Under such conditions border rows seemed unnecessary. Since alternate rows are harvested for forage, the distance between rows harvested for seed is sufficient to minimize danger of mechanical mixtures.

Sugar cane experiments in the Lesser Antilles and British Guiana [trans. title], H. WILLIAMS (*Rev. Bot. Appl. et Agr. Colon., 6 (1926), No. 56, pp. 219–228; also Sta. Agron. Guadeloupe, Bul. Tech. 3 [1926], pp. 12*).—A résumé of variety, fertilizer, cultural, and miscellaneous experiments with sugar cane reported on from the several islands of the Lesser Antilles and from British Guiana.

Investigations on high-nicotine tobacco (*New York State Sta. Rpt. 1926, p. 18*).—Variation between individual untopped plants of certain tobacco selections (E. S. R., 54, p. 534) was almost 1.5 per cent in the nicotine in the dry leaf. For plants grown from seed from earlier selections, the nicotine content has varied about 2 per cent for both untopped and topped plants. Topping has increased nicotine from 1.5 to 3.5 per cent in *Nicotiana rustica* and 1.5 to 2.5 per cent in *N. tabacum*. Fertilizing broadcast seeding of *N. rustica* increased nicotine slightly, especially when dried blood and urea in combination with potash were applied. Broadcast seeding has generally given much lower nicotine values than did cultivated plants.

Rate, date, and depth of seeding winter wheat, W. A. MOSS (*Idaho Sta. Bul. 145 (1926), pp. 3–11, fig. 1*).—Experiments at the High Altitude Substation showed 65 lbs. per acre of treated seed to give best results for late plantings and 50 lbs. for early plantings, and depths of from 2 to 3 in. were indicated. September 1 appeared to be the best time to plant winter wheat on dry farm areas of eastern Idaho. Kharkof, Kanred, Triplet, and Turkey, in order, are currently the best yielding winter wheats. The best winter wheats have averaged 13.1 bu. more per acre than the four leading spring wheats.

The effects of different tillage methods on wheat yields are tabulated and recommendations given on cultural practices and on selection and treatment of seed.

A sow thistle survey of Ontario (*Farmers' Advocate and Home Mag., 61 (1926), No. 1772, pp. 1257, 1287, figs. 5*).—Current results of a survey indicated that the Province of Ontario, Canada, is widely infested with perennial sow thistle, the heaviest infestation being possibly in Wellington and Perth Counties, followed by Simcoe, York, and Ontario Counties.

HORTICULTURE

[Horticultural investigations at the Illinois Station] (*Illinois Sta. Rpt. 1925, pp. 144–147, 149, 150, 151, 152, 153–157, 159–167, 168–170, 172, 173, figs. 7*).—Long-continued apple breeding experiments, conducted by C. S. Crandall, have resulted in many thousands of seedlings, among which 427 have been selected as of possible value to fruit growers. Peach breeding work, conducted by Crandall and G. E. Fager, has yielded 238 promising seedlings. Continued studies (E. S. R., 54, p. 334) by W. A. Ruth and V. W. Kelley upon

the summer pruning of young apple and peach trees showed that cutting back has very little influence in developing new side shoots. The first bud below the cut continued the vertical growth of the removed branch. With rare exception, the second bud below the cut produced the only strong lateral. In no case did the lateral branch compete with the leader either in rapidity or in direction of growth.

The results of variety tests with fruits, conducted by Ruth, F. E. Carver, and A. S. Colby, are briefly reported. Of many grapes tested by Colby for keeping qualities in cold storage, the Agawam, Barry, Delaware, Concord, Brighton, Herbert, Lindley, and Vergennes were especially satisfactory. With protection, certain vinifera varieties were fruited successfully outdoors. Preliminary observations on Moore Early and Concord vines indicated that training to either one- or two-cane trunks does not materially affect yields. Self-pollination of Quillen, Latham, Older, Plum Farmer, and Conrath raspberries yielded promising seedlings, as have also crosses between Royal and King and Plum Farmer and June. Observations by Colby on strawberry beds watered with overhead irrigation showed increases in yield approximating 200 to 300 per cent.

Vegetable fertilizer studies, conducted by J. W. Lloyd, showed the value of phosphorus for the tomato. Manurial substitutes were unsatisfactory for the muskmelon, and, although increasing yields, were unprofitable for sweet corn. Of three forms of phosphorus used on tomatoes, bone meal proved best, followed in order by acid phosphate and rock phosphate. Phosphorus gave the largest increases when used without manure, but the highest tomato yield was obtained where manure, limestone, bone meal, and potash were used in combination. Short season, early planted crops, such as spinach, lettuce, and beets, gave the greatest returns from fertilizers. Manure proved a better source of organic matter than did cover crops.

H. W. Anderson reports that the Conqueror watermelon is resistant to wilt and at the same time of good quality.

Sweet corn breeding studies, conducted by W. A. Huelsen and M. C. Gillis, have resulted in some promising strains. Homozygous corn strains are being developed for future cross-breeding purposes. Consistent increases in sweet corn yields were obtained by treating the soil with from 200 to 400 lbs. of acid phosphate per acre. Larger applications failed to give satisfactory returns. The use of muriate of potash at the rate of from 50 to 100 lbs. also increased yields, but the best results were obtained by combining potash and acid phosphate. Nitrogen alone or in combination with phosphorus and potash failed to increase yields. Huelsen found an apparent correlation between black discoloration in canned corn and the fertilizer treatment of the soil. Applications of acid phosphate in large amounts (800 lbs. per acre) apparently increased the black coloration. In some instances applications of potash in the form of muriate decreased this discoloration. There was evidently a close correlation between low yields and increased discoloration. Canned field corn with a known high protein content showed 6.5 times as much black color as field corn with a low protein content.

Comparisons by F. F. Weinard and H. B. Dorner of the yield and quality of roses grafted on Odorata and Manetti roots showed Odorata to be a satisfactory stock. Columbia roses grafted on Manetti and Odorata roots yielded an average of 23 and 22.2 flowers per plant, respectively. Weinard found that Laddie carnations yielded an average of 0.5 blossom more per plant on new than on used soil. Selection studies with roses and carnations indicated that commercial varieties are heterogeneous, and may be improved by plant

selection. Work with gladioli by Weinard and S. W. Decker indicated that corms must be allowed a definite rest period before forcing. Best results were obtained with plantings made in January or later. Corms stored at room temperature flowered on an average one week earlier than those stored at 38° F. A study by Weinard and J. Hutchinson of orchid seedlings resulting from crosses within the Cattleya group showed that blooms of these new varieties compared favorably with those of imported plants now forbidden introduction by quarantine.

[Horticultural investigations at the New York State Station] (*New York State Sta. Rpt. 1926, pp. 18, 19, 44–49*).—Fertilizer experiments in vineyards at Fredonia, Urbana, and Hudson again showed (E. S. R., 54, p. 537) that nitrogen alone is sufficiently beneficial to return a profit. No evidence was secured during the year to indicate any differences of any character between budded and grafted apple trees. French crabs proved superior to Northern Spy as root stocks for several standard apples. Slight but inconclusive evidence was obtained that Rome Beauty trees propagated from high-producing parents were yielding better than those from low-producing parents. Continued observations upon Baldwin trees obtained from widely scattered sources showed consistent uniformity irrespective of the point of origin. Observations upon cherries worked upon Mazzard and Mahaleb stocks showed the Mazzard to be distinctly superior for all sweet and for most of the sour cherries.

Nutrient studies with French crab seedlings showed that these trees will make good growth under a variety of proportions of the various nutrient salts provided that the solutions are very dilute and each ion is furnished in sufficient amount by frequent change of solutions. Dilute nutrient solutions gave somewhat better top growth and very much better root growth than did concentrated solutions. New roots developed only under conditions of very low total concentration of nutrient salts. Studies showed a very high variability in seedlings even under uniform conditions. In pure sand and with distilled water 1-year-old seedlings developed an unexpected amount of top and root growth, indicating the presence of a considerable reserve energy.

Sprays and spraying materials, T. J. Talbert (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 44–53*).—In discussing various important spraying materials, their introduction, and development, the author reports that studies at the Missouri Experiment Station in 1924 and 1925 show that differences in the manner of preparing Bordeaux mixture had no material influence on its value in controlling fungi or its tendency to injure fruit and foliage. No greater injury resulted from using 40-hour-old Bordeaux mixture than from that used immediately after preparation. The author urges that the experiment stations take the leadership in the introduction of new sprays rather than simply follow the lead of commercial organizations.

Factors influencing the quality of fresh asparagus after it is harvested, C. S. Bisson, H. A. Jones, and W. W. Robbins (*California Sta. Bul. 410 (1926), pp. 3–28, figs. 13*).—Asparagus spears stored with their bases in water in chambers having temperatures of 33, 41, 56, 77, and 95° F. gained decidedly in length and weight. The gains were larger at the higher degrees, indicating that temperature is the chief factor determining the rate of growth in storage. In all lots the maximum rate of increase took place during the first day, followed by a slowing down. At 77 and 95° the development of molds decidedly shortened the period of storage. The increase in weight and length of spears was generally accompanied by a loss in reducing substances and in total sugars, the rate of which again was correlated with temperature. At 33° there was a very slight gain in these substances during the first 24 hours, and at 41 and 56° there was,

following an initial loss, a very slight gain in the second day, again followed by a decrease. This loss of sugars during storage is believed to be due to the transformation of sugars to lignin and other substances.

A microscopical study of the structure of spears showed a general increase in the amount of fiber at all temperatures utilized. This increase was substantiated by chemical determinations of crude fiber. The rate of increase of fiber was slowest at low temperatures.

As a practical deduction from the experiments, the authors point out that asparagus should be stored as quickly as possible after cutting in chambers maintained at slightly above 32°.

[Copra meal as a fertilizer], J. GUERRERO (*Guam Sta. Rpt. 1925, p. 16*).—Copra meal applied at the rate of 1,000 lbs. per acre proved a satisfactory fertilizer for Kentucky Wonder beans, increasing the yield to approximately twice that of the untreated plat.

Cantaloupe production in California, J. T. ROSA and E. L. GARTHWAITE (*California Sta. Circ. 308 (1926), pp. 48, figs. 29*).—This circular presents general suggestions upon the culture and handling of the cantaloupe under California conditions, discussing such points as seed selection, varieties, planting, irrigation, protection from insect and fungus pests, determination of picking maturity, packing, shipping, etc.

Ginger (*Jour. Jamaica Agr. Soc., 30 (1926), No. 8, pp. 326–334*).—A brief discussion of the culture and curing of ginger.

Breeding new varieties of canning peas, E. J. DELWICHE and E. J. RENARD (*Wisconsin Sta. Research Bul. 70 (1926), pp. 31, figs. 15*).—Individual plant selection has been a successful method of improving canning peas, resulting in productive strains possessing unusual uniformity in plant and pea characters and in the time of ripening. Mass selection, on the other hand, has yielded no such favorable results. Mutations were found at rare intervals, as shown in the discovery of aberrant forms totally unlike any peas ever grown by the station. Hybridization has also resulted in valuable new varieties—for example, Horal, a cross between the Horsford and Alaska varieties, which combines the desirable qualities of both parents and is unusually resistant to root rot. The authors discuss the methods employed in hybridization and the resulting segregation of characters, and describe the new strains and varieties which have resulted from these studies.

Has ringing any place in commercial orchard practice? F. S. HOWLETT (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 22–28*).—This is a report of studies at the Ohio Experiment Station upon the effect of removing 0.25-in. rings of bark from the base of one or two of the main scaffold limbs of young apple trees. Ringing decreased the number but had little effect upon the size of leaves. Measurements on nine trees showed only one case where the leaves of ringed limbs were significantly larger than those of untreated limbs. The foliage of ringed limbs of tilled trees or of those growing in sod with adequate fertilization was dark green and vigorous. The ringing on June 17 of limbs of 10-year-old Baldwin trees had a slight dwarfing effect on the terminal length growth as compared with that of unringed limbs. Despite a heavy frost, the ringed limbs produced a good crop of fruit the year following the treatment, while, at the same time, the unringed limbs on the same trees produced nothing. Ringing is suggested as a means of inducing filler trees to become fruitful.

The effect of ringing filler trees in an apple orchard and its commercial possibilities, F. N. FAGAN (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 20–22*).—The favorable results obtained from the June ringing of young Baldwin, Stay-

man Winesap, McIntosh, and Rome apple trees led the author to suggest the advisability of adopting this practice in a commercial way in closely planted orchards in which the danger of crowding is imminent. The only mortality resulting from ringing occurred in trees standing in thin soil underlaid with ledge.

Starting the apple orchard, C. L. BURKHOLDER (*Indiana Sta. Circ. 133 (1926), pp. 27, figs. 9*).—Touching briefly upon the economic status of apple growing in Indiana and upon the cost of establishing orchards, the author discusses the planting and general care of young orchards. Information upon soil management and fertilizers is contributed by F. P. Cullinan, and that upon insect and disease control by the departments of botany and entomology.

Experiments in cool storage of apples, D. B. ADAM and J. E. HARRISON (*Jour. Dept. Agr. Victoria, 23 (1925), No. 4, pp. 226–234*).—This is a further report (E. S. R., 54, p. 643) upon the results of cold storage investigations with fruit in Victoria, Australia.

Records taken in 1923 on early picked, unwrapped Jonathan apples stored in direct expansion chambers at 32 and 37° F. showed much less scald development at the higher temperature, the percentages of sound fruits being 15+ and 77+ per cent, respectively. On the other hand, in the case of riper fruits practically no scald developed at either temperature, whether or not the apples were wrapped in oil paper. Similar investigations conducted in 1924 with Jonathan and Rome apples bore out the value of the higher temperatures in reducing scald in the Jonathan variety. Conflicting results obtained with oiled and plain paper wrappers prevented the drawing of definite conclusions, although in several instances the oiled wrappers were apparently the more effective. Jonathans picked April 7, 1924, and stored in direct expansion chambers at 32, 34, and 37° showed on June 25, 56, 55, and 97 per cent of sound fruits, respectively. On the other hand, in Rome apples, scald apparently developed more readily at 37 than at 32°, leading the authors to suggest that scald in the two varieties may be due to different causes. Observations on lots of Jonathan and Rome harvested at different stages gave further evidence that in these varieties mature fruits are the least susceptible to scald.

The growth of the fruit of the Elberta peach from blossom bud to maturity, M. A. BLAKE (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 29–39*).—Measurements taken in 1925 at the New Jersey Experiment Stations upon the rate of growth of fruits of Elberta trees in their fifth season in the orchard showed two distinct periods of rapid accretion, namely, from June 2 to 8, 45 to 52 days after blooming, and again as the fruits attained full maturity in August. Observations on the opening of flower buds on twigs in the upper part and in the center of the tree showed that the latter were slower to open and in many cases failed to set and carry fruit through to maturity, suggesting that late blooming buds contribute but little to the crop. Observations on fruit development showed that those below a certain suture diameter on a given date failed to mature, indicating the advisability of adjusting the spray schedule to the larger-sized fruits. In presenting dimension ratios for the fruit of several varieties, the author points out that there may be considerable variability on a single tree due to the position on the tree, proximity to neighboring fruits, etc.

Fruiting habit of the grape, H. G. SWARTWOUT (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 70–74*).—Data taken on 10 varieties of grapes pruned according to the four-arm Kniffin system showed that the shoots from canes on the upper wires are uniformly more productive than those originating from canes on the lower wires. Well-developed lateral canes were more productive than those

arising from wood 2 years of age or older. With the exception of Niagara, canes from wood 3 to 5 years old were more fruitful, both in respect to size and number of clusters per shoot, than were those from 2-year-old wood. Nodes producing laterals from 6 to 18 in. long were, with one exception (Elvira in 1923), more productive than those with none or very weak laterals. Records taken on canes 10 nodes in length showed the maximum production at the ninth and tenth nodes in Etta, Worden, and Catawba; at the seventh and eighth nodes in Concord, Wyoming, Missouri Riesling, Diamond, and Niagara; and at the fifth and sixth nodes in Moore and Elvira. In respect to ability to produce fruit from adventitious buds following the removal of the young canes, Missouri Riesling, Etta, Elvira, and Wyoming yielded nearly as much fruit as did normally pruned vines, while Diamond, Niagara, and Catawba were intermediate, and Concord, Moore, and Worden were comparatively unproductive.

Some effects of fruiting on the growth of grape vines, W. H. Chandler and A. J. Heinicke (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 74–80*).—Studies at Cornell University of the effect of removing the blossoms from unpruned Concord grapevines upon the weight increase of the roots and wood showed reductions in green weight of the tops and of the roots of fruiting plants of about 33 to 36 per cent and about 39 to 42 per cent, respectively. Records of leaf surface on fruiting and deflorated vines showed, with the exception of the pruned Delawares, a marked tendency for defloration to increase leaf area. Determinations of the dry matter in roots and in tops showed, particularly in unpruned vines, that the total residue of dry matter from a given leaf area was much greater with fruiting vines than with deflorated vines, the differences being most evident in the roots. In explanation, the authors suggest the possibility that less material was used in respiration for a given dry weight of fruit than for the same dry weight of other tissues, or that the removal of material from the leaves to the fruits made possible a more rapid photosynthesis.

The influence of pruning on the germinability of pollen and the set of berries in Vitis vinifera, A. J. Winkler (*Hilgardia* [*California Sta.*], *2 (1926), No. 5, pp. 107–124, figs. 6*).—Investigations conducted with several vinifera varieties of grapes pruned and deflorated in different degrees of severity ranging from nothing to the removal of all but the basal buds on spurs showed that pruning may exert a very definite influence upon pollen germination and upon the setting of fruits. Using as a standard normally pruned vines, increases in some instances in the germinability of pollen reached a maximum of 606 per cent. In 12 out of 17 cases severe pruning reduced the percentage of germination below that of normally pruned vines.

Especially in those varieties subject to the shelling of berries, moderate pruning greatly increased the set of normal berries per bunch as compared with that of the normally pruned vines. Furthermore the percentage of normal sized berries on the cluster was increased as the severity of the pruning was decreased. Both in number and in percentage of normal berries per cluster severely pruned vines were inferior in 6 out of 8 varieties tested to normally pruned vines.

The deleterious effect of severe pruning on both the pollen and the size and number of the berries per cluster is believed by the author to indicate that both the male and the female floral organs are affected by the degree of pruning. Data taken on the foliar development of treated vines are thought to indicate that the number of leaves, especially during the early part of the season, may be greatly concerned with the behavior of the pollen and the setting of the fruits.

Propagation of the date palm, with particular reference to the rooting of high offshoots, F. J. CRIDER (*Arizona Sta. Bul. 115 (1926), pp. 295–313, figs. 16*).—Of several practices employed in the propagation of the date palm, alterations in the soil temperature of greenhouse beds in which offshoots were set gave no results in promoting rooting. No significant differences were found between sand, stable manure, and soil as rooting media. Comparing lath shelter and open nursery plantings, the percentage of rooting was slightly greater in the latter. The use of a canvas shelter proved altogether unsuccessful. Offshoots taken in late spring rooted much more successfully than those taken in early fall. Offshoots with roots formed prior to separation from the mother palm grew much more readily than those without roots. The mounding of earth about the base of attached offshoots induced rooting. In the case of high offshoots, the maintenance of a moist medium about the base of a shoot induced satisfactory rooting and apparently justified the construction of scaffolding to hold the boxes of soil. General instructions for the planting and care of offshoots are included.

FORESTRY

World forestry number (*World Agr., 6 (1926), No. 2, pp. 433–444, figs. 10*).—This number contains the following papers: The World Forestry Congress of 1926, by S. T. Dana; Past, Present, and Future of Forestry in Germany, by C. A. Schenck; Fifty Years of Forestry in the United States, by W. B. Greeley; Forest Development in the Philippine Islands, by G. P. Ahern; Forest Practices as Affected by Land Ownership, by R. S. Hosmer; Forest Work of the Tropical Plant Research Foundation, by D. M. Matthews; Public Policies Toward Private Forests, by W. N. Sparhawk; and Town Forests and Farming, by H. A. Reynolds.

The forest resources of Canada, R. D. CRAIG (*Econ. Geogr., 2 (1926), No. 3, pp. 394–413, figs. 18*).—A comprehensive article discussing various factors concerned in Canadian forestry, including climatic relations, species and their distribution, forest industries—their location and importance, and the general situation in regard to utilization and reforestation.

Danger of frosts studied at Wind River Nursery (*Jour. Forestry, 24 (1926), No. 7, pp. 839, 840*).—Studies by A. G. Simson show that under a cover of 10-oz. burlap 28° F. was not reached until the outside temperature dropped to 21°. At higher temperatures the insulating value of burlap was less, the differential being only 2° when the outside temperature was 42°. It is pointed out that the continued use in spring or fall of this heavy burlap covering tends to make the plants more susceptible to frost injury.

Theoretical considerations regarding factors which influence forest fires, L. F. HAWLEY (*Jour. Forestry, 24 (1926), No. 7, pp. 756–763*).—The mechanism of combustion is discussed in its relation to general forest conditions, including the effects of temperature, moisture content, air supply, ignition temperature, heat of combustion, and the state of aggregation or surface volume ratio of fuel. The state of aggregation is believed to outweigh all other variables affecting the ease of ignition, but from the standpoint of forecasting dangerous fire conditions moisture content, because of its tendency to large and rapid fluctuations, is deemed the most important factor.

Harvesting timber crops in the national forests of the East and South, R. M. EVANS (*U. S. Dept. Agr., Misc. Circ. 75 (1926), pp. II+13, figs. 9*).—A brief discussion upon the methods and procedure employed in the harvesting and sale of timber and other forest products in the national forests of the east-

ern United States, with comments upon the species of wood available and the uses to which they are adapted.

Predicting the second cut in national forest management plans, D. DUNNING (*Jour. Forestry, 24 (1926), No. 7, pp. 785–790, fig. 1*).—Accompanied by a general discussion, diameter growth prediction curves are presented based upon increment borings made upon 155 dominant and codominant white fir trees released by cuttings in 1882, the data being recorded approximately 40 years later.

Yield, stand, and volume tables for white fir in the California pine region, F. X. SCHUMACHER (*California Sta. Bul. 407 (1926), pp. 3–26, figs. 3*).—The tables presented in this paper are based upon measurements taken in 157 normally stocked, even aged sample plats of white fir, covering a range of age classes from 40 to 150 years and in various conditions of productivity. In general, white fir stands exhibited an exceptionally slow growth up to an age of about 30 years, followed by a marked acceleration to about the ninetieth year. On account of its abundant seeding ability and tolerance to shade the white fir is deemed well adapted to the shelterwood system of silviculture, in which the establishment of reproduction is provided for before all the overwood is removed. On account of the slow initial growth of white fir the preservation of advance reproduction is highly advisable.

Field manual of trees, J. H. SCHAFFNER (*Columbus, Ohio: R. G. Adams & Co., 1926, 3. ed., pp. 154*).—A few minor changes and corrections have been made in this third edition of the work previously noted (E. S. R., 48, p. 238).

The commercial woods of the South (*South. Lumberman, 125 (1926), No. 1629, pp. 163–179, figs. 25*).—Information is offered in this general article upon the distribution, supply, production, properties, and uses of all the important lumber-producing species grown in the Southern States.

A universal index to wood, E. H. F. SWAIN (*Jour. Forestry, 24 (1926), No. 7, pp. 735–755, figs. 2*).—In this paper the author outlines a system of wood identification and classification based primarily upon structural characters, density, etc., rather than upon the usual botanical relationships.

DISEASES OF PLANTS

[Plant disease investigations at the Illinois Station] (*Illinois Sta. Rpt. 1925, pp. 43–48, 150, 151, 152, 153, 158, 159, 170–172, figs. 7*).—In continuation of studies previously reported by Holbert et al. (E. S. R., 53, p. 349) further data are given on the occurrence of root and stalk diseases of corn. It was found that scutellum rot reduced the yield 17.3 per cent during the 5 years 1920–1924; Diplodia, 34.2 per cent during the same period; Gibberella, 40.6 per cent during 1924; Cephalosporium, 6.2 per cent during the 3 years 1922–1924; and Fusarium, 8.6 per cent during the 3 years 1921–1923.

Experiments on time of planting, effect of applying limestone and fertilizer rotations, and breeding for resistance for the control of these diseases showed that nearly disease-free seed and seed infected with Cephalosporium and Fusarium made the best yields when planted at an early or intermediate date, May 1 to 15, while seed susceptible to scutellum rot gave the best yields when planted from May 10 to 21. Applying limestone gave little control. There was more lodging on soil cropped frequently in corn. Certain correlations of plant and ear characters with disease have been established by C. M. Woodworth and F. L. Winter, and through mass selection a strain of corn has been developed that shows an increased yield of 5.6 bu. per acre. Some indications were found by E. E. DeTurk et al. that phosphate utilization by strains of corn may have a bearing on disease.

Experiments by B. Koehler, G. H. Dugan, and J. R. Holbert showed encouraging results for the seed treatment of corn for the control of Diplodia and Gibberella when treated with some of the mercury phenolate compounds. No control of scutellum rot, however, was obtained by the treatments.

Investigations by H. W. Anderson have shown that none of the common spray materials controlled bacterial spot, or shot hole disease, of peaches, while sodium silicofluoride and combinations of this with sulfur gave excellent control and did not cause injury to the foliage.

Investigations on the effect of fertilizer and cultivation on the control of shot hole disease gave inconclusive results, but it was found that the amount of bacterial shot hole on nitrated plats was about the same as on those not nitrated. The trees on the untreated plats were defoliated much earlier in the season and were lacking in vigor throughout the summer.

In continuation of studies on the fire blight of pears and apples, Anderson reports that of 500 seedlings of *Pyrus callaryana* inoculated with pure cultures of the fire blight organism, none was resistant. Bartlett pears top-worked on *P. ussuriensis* seedlings also blighted. Fire blight is said to have been unusually destructive to apples throughout the State during the two years preceding the report. Cutting out of cankers as practiced by growers did not prove an unqualified success.

Investigations by A. S. Colby on the control of crown gall of raspberries have shown that germicides applied to the soil for the control of the disease must be thoroughly mixed with it.

In attempting to control raspberry anthracnose it was found that less than 10 per cent of the raspberry canes which were sprayed with a combination of lime sulfur and Kayso showed a heavy to medium infection, while the remaining canes showed only slight or no infection. Spraying canes with lime sulfur alone did not give as good results as those where a combination spray was employed.

Investigations on the control of aster wilt in gardens, by F. F. Weinard and S. W. Decker, indicate that plants which have not been transplanted show a greater resistance to wilt than those transferred from indoors. On the other hand, plants which had their growth checked by transplanting or drought were found to be probably more susceptible to wilt than those which had not been checked.

[Plant disease investigations at the New York State Station] (*New York State Sta. Rpt. 1926, pp. 26–31*).—A summary account is given of studies of raspberry mosaic, in which it is stated that the control of the disease through spraying and dusting for the elimination of the insect carriers did not give the results which were anticipated. It was found in the course of the investigations that only the youngest instars of the principal aphid carrier were effective in transmitting the disease. A new virus disease of black raspberries previously confused with streak and wilt was proved to originate in red raspberries and to be carried to the black raspberry by aphids. This disease is thought to be red raspberry mosaic as it affects black raspberries. It is said to be quite destructive to black raspberries and does not produce typical mosaic symptoms.

Attention was given to some of the diseases of canning crops, and Ascochyta blight of peas was found to cause more loss to the canning industry than any other disease. It is said to be seed borne, and progress is reported in locating sources of healthy seed.

The effect of time of planting Wells Red Kidney beans on the incidence of bean blight showed that early plantings were severely attacked by blight

of the foliage. Late plantings escaped foliage blight, but by reason of abundant rains there was much blight on the pods. Plantings made between June 15 and 20 at Geneva on clover sod turned under the previous fall are recommended for the control of this blight.

For the third successive season Phoma and bitter rot failed to appear in experiments carried on for their control, but data were secured showing the value of Bordeaux mixture and lime sulfur for the control of scab. Bordeaux mixture oil, lime-sulfur solution, dry mix sulfur lime, and a form of colloidal sulfur, all applied during the pink period, gave equally good control of scab. Russeting of the fruit was observed in one instance where Bordeaux mixture with 2 per cent engine oil emulsion had been used, and a similar amount of injury followed an application of lime-sulfur solution. Zinc sulfide applied at the rate of 5 lbs. to 100 gal. of water gave no indication of causing injury.

For the control of blackleg of cruciferous crops by seed treatments partial control was secured with dusts, but soaking the seed with organic mercury or corrosive sublimate solutions was not found dependable. Hot water treatments gave the best control. The hot water treatment of cauliflower seed gave good control of black rot, and about 1,500 lbs. of cauliflower, cabbage, and Brussels sprouts seed were treated in the spring of 1926 for farmers on Long Island. Some evidence of resistance to blight was found in tests of varieties of cauliflower from various sources. Inoculation experiments showed that mustard, rutabaga, flat turnip, and Chinese cabbage were all very susceptible to mosaic, but rape was somewhat resistant.

Preliminary experiments on the treatment of seed potatoes for the control of diseases are said to have given promising results where two organic mercury compounds were used.

Report on the occurrence of fungus, bacterial, and allied diseases of crops in England and Wales for the years 1922–1924, G. H. PETHYBRIDGE (*[Gt. Brit.] Min. Agr. and Fisheries, Misc. Pub. 52 (1926), pp. 97, fig. 1*).—The present report, dealing with the years 1922, 1923, and 1924, continues the series beginning with 1917, the most recent presentation of which, by Cotton, has been noted (E. S. R., 49, p. 645). The information supplied by advisers is supplemented by that from regular reports containing data, and in some cases special memoranda, concerning plant diseases.

Plant diseases in relation to certification of seeds, H. T. GÜSSOW (*Quebec Soc. Protect. Plants Ann. Rpt., 16 (1923–24), pp. 72–77*).—It is insisted that study is urgently needed of the diseases conveyed by seeds, the mechanism by which seeds become carriers, and reliable information on the questions of rational and effective control of seed-borne diseases, together with precise information on their recognition in field or in the package.

A review of our knowledge concerning immunity and resistance in plants, J. E. HOWITT (*Quebec Soc. Protect. Plants Ann. Rpt., 16 (1923–24), pp. 9–24*).—A review to date is given of the general subject of plant immunity and resistance, which is thought to promise a solution for some of the most outstanding and important pathological problems of the present time, such as the prevention of loss from grain rusts; the control of citrus canker in the South; the reestablishment of the American chestnut in the United States; the production of beans free from anthracnose, mosaic, and root rot; and the prevention of soil diseases, such as cabbage yellows, flax wilt, cotton wilt, tobacco root rot, and stem and root rot of canning peas. A review of the more important accomplishments in the production of resistant plants is concluded with the statements that substantial and permanent progress has been made in the production and selection of resistant varieties of plants; that

further and more extensive studies concerning the existence of biologic strains of different parasitic fungi are required; that knowledge concerning the biochemical causes of resistance is fragmentary and inadequate; and that future work on this subject lies largely in the field of biochemistry. The list of related literature comprises 213 titles.

Influence of time and temperature on the rate of growth of certain fungi, H. S. Fawcett (*Abs. in Phytopathology, 14 (1924), No. 2, pp. 119, 120*).—Experiments with mycelia of *Pythiacystis citrophthora* and *Diplodia natalensis* when grown for long periods showed that they were not influenced by the time element in their response to temperature. During short periods of growth, especially at the higher temperatures, the time element was found to have an important influence on the rate of growth.

Recent advances in dusting methods, R. E. Smith (*Abs. in Phytopathology, 14 (1924), No. 2, pp. 121, 122*).—Attention is called to some advantages of the selfmixer in the preparation of dust fungicides and insecticides.

Botrytis cinerea in Alaska, J. P. Anderson (*Phytopathology, 14 (1924), No. 3, pp. 152–155, pl. 1*).—It is claimed that more than three-fourths of the fungus injury to cultivated plants in southeast Alaska is caused by Botrytis. The author reports having collected the fungus on one or more species of 88 genera of seed plants, three of ferns, and on Lunularia. While *B. cinerea* is supposed to be the conidial stage of *Sclerotinia fuckeliana*, the author reports that he has never found the ascigerous stage of the fungus in Alaska, and that the sclerotial stage has been observed only a few times.

The growth of Ophiobolus graminis Sacc. in relation to hydrogen-ion concentration, R. W. Webb and H. Fellows (*Jour. Agr. Research [U. S.], 33 (1926), No. 9, pp. 845–872, figs. 8*).—Kirby (E. S. R., 53, p. 348), Davis (E. S. R., 54, p. 649), and others having reported differently on the influence of soil reaction on the occurrence and severity of attacks of *O. graminis*, the authors studied the growth of the fungus under different H-ion concentrations in several types of liquid and solid media, and under different environmental conditions. A single spore strain of the fungus was used throughout the experiments.

In general, *O. graminis* grew well in pure culture on solid and liquid media over a wide range of active acidity and alkalinity. The pH range and the pH optimum for growth were variables, depending upon the physical and chemical nature of the medium and the environmental factors. Temperature influenced the optimum reaction for fungus growth in potato-dextrose decoction, but did not materially influence the pH range through which growth occurred. The optimum temperature was not altered by variations in the H-ion concentration. The length of the period of growth was found to influence the pH optimum for fungus growth in potato-dextrose decoction, but did not appreciably modify the pH growth range. Neither diffused light nor total darkness appreciably affected the pH optimum or the pH range for growth. While the H ion generally proved to be more toxic to the growth of the fungus than the OH ion, the toxicity of each was variable, depending upon the medium. The reaction of the substrate sufficient to cause death of the fungus was several tenths of a pH more acid or more alkaline than that sufficient to cause inhibition of growth. Progressive and reversible shifts in the reaction of the media were induced by the growth of the fungus. The direction and the magnitude of these shifts varied with the temperature, the duration of the growth interval, the initial reaction, and the chemical and physical natures of the media.

The production of substances toxic to plants by Penicillium expansum, C. C. Barnum (*Phytopathology, 14 (1924), No. 5, pp. 238–243, figs. 2*).—As a result of his experiments the author claims that a toxic principle is produced

in the culture solution upon which *P. expansum* had been grown. This product of fungus growth is capable of causing wilting in certain herbaceous plants, whether absorbed through the cut ends of the stem or through the roots of the growing plants.

Spore germination of Ustilago striaeformis, W. H. DAVIS (*Phytopathology, 14 (1924), No. 6, pp. 251–267, pls. 3, fig. 1*).—An account is given of investigations undertaken to determine the natural conditions under which the spores of this fungus germinate, the nature of the germination, and the features of the fungus on each host investigated. This smut was found to parasitize timothy, redtop, June, and orchard grass. The smut spores are considered to be resting spores and, under natural conditions, must pass through a period of afterripening before germinating. Under laboratory conditions an average rest period of 240 days was required for afterripening, and under field conditions about 265 days.

The cardinal temperatures for the germination of the smut spores from all four hosts were minimum 7°, optimum 22°, and maximum 35° C., with some variation in the minimum and maximum temperatures of spores from different hosts.

Reactions of selfed lines of maize to Ustilago zeae, H. K. HAYES, E. C. STAKMAN, F. GRIFFEE, and J. J. CHRISTENSEN (*Phytopathology, 14 (1924), No. 6, pp. 268–280*).—In order to determine the possibility of developing varieties of corn resistant to smut a study was made in self-fertilized lines of several varieties and strains to ascertain their reaction to smut.

The results indicate that the development of resistant varieties is the most promising means for the control of corn smut. A normal variety of corn is said to be in a highly heterozygous condition, and selection in self-fertilized lines offers the most promising means of isolating smut resistant strains of corn. Ear infection is said to be more serious than infection of other parts of the plant, and flint varieties appear to be somewhat more susceptible, particularly to ear infection, than dent varieties.

The localization of smut on the plant is considered a strain characteristic. Some selfed strains were uniformly infected on one of the lower nodes of the stalk, others produced a high percentage of ear infection, and still others were infected chiefly in the tassel. F_1 crosses between resistant self-fertilized strains were more resistant than either parent, while F_1 crosses between resistant and susceptible strains produced an intermediate type of infection. Resistance and susceptibility are considered to be conditioned by genetic factors.

Notes on the climatic conditions influencing the 1923 epidemic of stem rust on wheat in Illinois, L. R. TEHON and P. A. YOUNG (*Phytopathology, 14 (1924), No. 2, pp. 94–100, fig. 1*).—Data are presented correlating precipitation and temperature with primary and secondary infections of stem rust in several localities in Illinois in 1923.

Anthracnose as a cause of red clover failure in the southern part of the Clover Belt, A. J. PIETERS and J. MONTEITH, JR. (*U. S. Dept. Agr., Farmers' Bul. 1510 (1926), pp. II+18, figs. 11*).—A popular account is given of the anthracnose of red clover caused by *Colletotrichum trifolii*. This disease is said to be a limiting factor in clover culture in the South. The organism is widely distributed, and it is believed to exist to an unknown extent north of the Ohio River.

The authors state that the only way to avoid loss from the anthracnose is to use seed from a strain known to be resistant to the disease or seed produced from a stock propagated over a considerable period in the infected territory. Where seed of unknown origin must be used, it is recommended that seeding be made in late summer or early fall wherever experience has not shown this to

be impracticable. Late summer or early fall seeding is said to give the clover plants a chance to escape the early attack of the disease and produce a hay crop, even though there may be no second growth.

The rust of cowpeas, F. D. Fromme (*Phytopathology, 14 (1924), No. 2, pp. 69–79, pl. 1, fig. 1*).—In a previous paper (E. S. R., 45, p. 445) the difference in pathogenicity of a rust of cowpea from the bean rust (*Uromyces appendiculatus*) was pointed out. Additional study here reported has shown morphological differences between the rusts, and the author considers the fungus which attacks the cowpea to be *U. vignae*. In addition to occurring on four species of Vigna, this rust also attacks one species of Dolichos and one of Phaseolus. Infection studies with a strain of the rust obtained from the Blackeye cowpea showed it to be closely restricted in its host range. It has infected only a few varieties or strains of the Blackeye type.

Control of diseases of cucurbits, J. Guerrero (*Guam Sta. Rpt. 1925, p. 16*).—Spraying with Bordeaux mixture before reaching the vining stage and once a week thereafter proved to be the most efficacious measure for the control of powdery and downy mildew. Muskmelon vines were killed by sulfur-dust applications, but neither cucumber nor squash vines were affected by the treatment.

Flax rust and its control, A. W. Henry (*Minnesota Sta. Tech. Bul. 36 (1926), pp. 3–20, pls. 2*).—The results are given of a study of flax rust caused by *Melampsora liniperda* or *M. lini*, as it is commonly known. In Minnesota and neighboring States, the disease is said to appear the latter part of June, but it does not assume epidemic form until late in July or early in August. The uredinial stage may persist until killing frosts occur, but apparently does not overwinter. The telial stage readily overwinters and starts the initial infections the following year. In an experiment on a peat bog, flax was sown in plats having water levels varying approximately from 1 to 5 ft. from the surface. The heaviest infections of rust occurred on the intermediate water levels, where the flax was the most vigorous.

Varietal resistance to the disease has been observed, and immune varieties of both blue- and white-blossomed seed flax have been found. Crosses were made between immune and susceptible varieties, and the F_1 plants of all crosses were immune. Segregation occurred in the F_2 generation, and the behavior of the segregates is said to indicate that it will be possible to combine immunity from rust with fiber characteristics or with other desired characters.

Certain strains of Argentine flax, in addition to being immune to rust, were fairly resistant to wilt. Wilt resistance and immunity to rust were not considered correlated but are apparently determined by different causes. Some evidence was obtained that indicates that the rust of cultivated flax may be specialized into physiologic forms. The use of immune varieties is considered the most promising method for control. While susceptible varieties are still in use home-grown seed should be used as far as possible, and it should be thoroughly cleaned to remove bits of straw; seeding should be done early; low-lying soils should be avoided; and on fields intended for flax, infected straw should be burned or removed before the new crop emerges.

Immunity to mildew (Bremia lactucae) and its inheritance in lettuce, I. C. Jagger (*Abs. in Phytopathology, 14 (1924), No. 2, p. 122*).—Eight varieties of European lettuce immune to mildew in California and Florida were hybridized with the so-called Iceberg lettuce, a very susceptible variety. The F_1 plants proved to be immune to the disease, and this character was found to be inherited in a simple Mendelian ratio in the second generation.

Bacterial slime disease of lettuce, R. E. and E. H. Smith (*Abs. in Phytopathology, 14 (1924), No. 2, p. 122*).—A bacterial disease of lettuce in the Imperial Valley and elsewhere in California is briefly noted.

Species of Fusarium isolated from onion roots, C. P. SIDERIS (*Phytopathology, 14 (1924), No. 5, pp. 211–216, pls. 3*).—In a study of the causal organism of the pink root of onions, the author isolated about 20 species and varieties of Fusarium from diseased and dead roots, some of which showed symptoms of the pink root disease while others did not. The following new species are reported and described: *F. cromyophthoron* n. sp. *F. rhizochromatistes* n. sp., *F. rhizochromatistes microsclerotium* n. v., *F. sclerostromaton* n. sp., *F. loncheceras* n. sp., and *F. loncheceras microsporon* n. v.

Mosaic and leaf roll of potatoes in Idaho, C. W. HUNGERFORD and J. M. RAEDER (*Abs. in Phytopathology, 14 (1924), No. 2, p. 123*).—The authors claim that at least three distinct types of potato mosaic occur in Idaho. The green and pink rose aphid was found to transmit the russet dwarf type of mosaic. This type of disease may appear as a slight mottling late in the season, but progeny from such plants may develop the disease in a severe form. Leaf roll may also appear late in the season as a slight rolling of the upper leaflets, but progeny from such plants may show leaf roll in advanced stages.

Alternaria solani as a cause of tuber rot in potatoes, D. FOLSOM and R. BONDE (*Phytopathology, 15 (1925), No. 5, pp. 282–286, pls. 3; abs. in Maine Sta. Bul. 328 (1925), p. 257*).—The authors report having isolated *A. solani* from lesions on potatoes in commercial storage, and with cultures from the lesions to have infected young tubers and foliage of greenhouse-grown plants. Immature tubers packed in diseased foliage became badly infected. Occasionally cultures did not react on media in the usual manner, and this is believed to indicate a saprophytic rather than a parasitic difference between biological strains.

Resistance of sorghum to loose and covered smuts, G. S. KULKARNI (*Phytopathology, 14 (1924), No. 6, p. 288*).—Dwarf, standard, and white milo and feterita were found resistant to both *Sphacelotheca sorghi* and *S. cruenta*, while all varieties of kafir and shallu tested were susceptible to both species of fungi.

Studies of a new Fusarium wilt of spinach in Texas, J. J. TAUBENHAUS (*Texas Sta. Bul. 343 (1926), pp. 3–23, figs. 6*).—A detailed account is given of a disease of spinach, the occurrence of which in Texas was previously reported by the author (E. S. R., 55, p. 849). This disease is said to be caused by the fungus *F. solani*, and although apparently similar in appearance to that of the spinach wilt described by Hungerford (E. S. R., 54, p. 49), it was found to be distinct from the latter and prevalent in many parts of the State. The symptoms of the wilt are said to be typical of a Fusarium in which the causal organism is confined to the root. All attempts to isolate the causal organism from any other part of the plant have failed.

Soil temperature was found to be an important controlling factor in the spread of the spinach wilt in Texas. Under conditions in the central part of the State the disease did not spread under the average outdoor temperatures of 72° F., or of 70° in the soil at a depth of 2 in., or of 68° at a depth of 4 in. The disease is said to increase with the increase of soil temperature above those mentioned.

As the causal organism attacks potatoes, the author suggests that spinach should not be planted in soil recently occupied by that crop, and that plantings should not be made during the months of high soil temperatures.

In connection with the Fusarium wilt, a new Rhizoctonia root rot was found, which causes serious damage and also opens the way to infection by this wilt. Rhizoctonia on spinach is considered different from that which causes sore shin of cotton.

Curly leaf transmission experiments, H. H. P. Severin (*Phytopathology, 14 (1924), No. 2, pp. 80–93, fig. 1; abs., p. 123*).—The results are given of numerous experiments on various phases of the transmission of curly leaf of sugar beets. The causative agent is said to be generally distributed in the foliage and beet root. Field and laboratory experiments have demonstrated that the disease is not transmitted through the soil or from beet to beet. Juice pressed from the leaves and roots of infected beets when inoculated into the crown of healthy ones caused typical curly leaf symptoms in some instances. The period of incubation in inoculation experiments varied from 12 to 39 days. When noninfective beet leafhoppers were allowed to feed on inoculated beets after curly leaf developed the disease was transmitted to healthy beets in from 2 to 13 days.

Infective beet leafhoppers are said to have retained their infectivity during all of the nymphal stages and during the entire adult life. Attempts to produce the disease by infecting the mouth parts of leafhoppers with *Bacillus morulans* failed to transmit the disease.

Progress report on curly-top of the sugar beet, E. Carsner and C. F. Stahl (*Abs. in Phytopathology, 14 (1924), No. 2, pp. 122, 123*).—Marked resistance to curly top in some strains of sugar beets is reported. Inoculation experiments are thought to give evidence that *Chenopodium murale* is more or less resistant to disease, and passing the virus of the disease through this resistant plant causes its attenuation. Successful producion of curly top by artificial inoculation of beets is reported.

Effect of environmental conditions on western yellow blight of tomatoes, M. Shapovalov (*Abs. in Phytopathology, 14 (1924), No. 2, pp. 120, 121*).—The author claims that the western yellow blight of tomatoes is of importance in seasons and regions with relatively high temperature, low humidity, and high evaporation. A progressive root decay was found in connection with the blight and species of Fusarium and Rhizoctonia were isolated from decaying roots, but their rôle in connection with the disease was not definitely determined.

The behavior of certain varieties of tomatoes towards Fusarium-wilt infection in California, M. Shapovalov and J. W. Lesley (*Phytopathology, 14 (1924), No. 4, pp. 188–197, pls. 2; abs. in Phytopathology, 14 (1924), No. 2, p. 121*).—The authors tested the reaction of a number of tomato varieties to the wilt fungus (*F. lycopersici*) by artificial inoculation and natural field infection. In the artificial inoculation experiments two distinct cultures of Fusarium were employed, both having been isolated from wilted plants in California. One of these cultures proved to be parasitic, causing the typical Fusarium wilt disease. The variety Norton proved resistant when tested in three widely separated localities in southern California, while Norduke, Marvel, and a California selection from Stone were resistant in two localities where tested. Most but not all of the varieties bred for wilt resistances at various experiment stations, as well as the variety Livingston Globe, proved resistant to wilt when planted in badly infected soil in California.

The relation of temperature and humidity to tomato leaf spot (Septoria lycopersici), F. J. Pritchard and W. S. Porte (*Phytopathology, 14 (1924), No. 3, pp. 156–169, pl. 1, figs. 9*).—A study was made of the distribution of tomato leaf spot in the United States. The heaviest losses caused by this disease were found to occur in the Middle Atlantic and Middle Western States, the disease being considered of little importance in the Northern and Southern States and apparently absent in the Pacific coast region. A rather definite correlation between relative humidity and temperature is believed necessary for the development of the fungus.

The stripe or streak disease of tomatoes in Quebec, T. C. VANTERPOOL (*Quebec Soc. Protect. Plants Ann. Rpt., 16 (1923–24), pp. 116–123, pls. 2*).—In 1923 tomatoes at Macdonald College showed a disease characterized by a long spindling growth of the upper part of the plants, a spotting, curling, and shriveling of the leaves, small irregular brown spots on the fruit, and brown, oblong, sunken markings on the stem and petioles. This disease resembles somewhat one which has been reported under a variety of names since about 1892. The author began a study of this disease in 1924, and the present is a progress report of that work, noting symptoms, distribution, and experimentation.

Host plants of Bacterium tabacum, J. JOHNSON, C. M. SLAGG, and H. F. MURWIN (*Phytopathology, 14 (1924), No. 4, pp. 175–180, pls. 2*).—Inoculation experiments conducted primarily to study winter hosts of *B. tabacum* gave infections upon 12 species of Nicotiana and 7 other members of the Solanaceae, 4 species of Cucurbitaceae, 13 of Leguminosae, 11 of Gramineae, 7 of Cruciferae, 6 of Compositae, 5 of Polygonaceae, 3 of Chenopodiaceae, 3 of Labiatae, 2 of Malvaceae, 2 of Umbelliferae, and single species of 13 other families of plants. The large majority of the plants inoculated were infected, and it is believed that the host range of *B. tabacum* is much larger than indicated by the results of the authors' experiments.

Overwintering of tobacco wildfire bacteria in New England, P. J. ANDERSON (*Phytopathology, 14 (1924), No. 3, pp. 132–139*).—As a result of three years' experiments and observations on the conditions under which wildfire bacteria pass the winter, the author concludes that organisms pass the winter most successfully in situations where they are not subjected to keen competition from the growth of other organisms, principally in fairly dry situations, as in cured leaves in the barn, leaves on plants standing in the field or thrown on the ground too late to rot, on boards and sash of seed beds, and dry fragments of pods.

Tobacco wildfire and tobacco seed treatment, H. E. THOMAS (*Phytopathology, 14 (1924), No. 4, pp. 181–187, fig. 1*).—Experiments of the author appear to indicate that there is little probability of carrying over *Bacterium tabacum* in refuse in fields, only slight infection having been secured in plats where refuse was buried under the plants.

For the control of the disease the author found that tobacco seed treated with mercuric chloride 1–1,000 germinated nearly or quite as well on soil and in thin sowings in moist chambers as did untreated seed. When seed from the same treated lots was held in bulk in muslin or in cheesecloth bags no germination was obtained at 26° or at 33° C. (78.8 and 91.4° F.). Seed treated with copper sulfate, potassium permanganate, potassium dichromate, and sulfuric acid showed no appreciable injury in the concentrations tested. The drying of wetted seed rapidly in direct sunlight or slowly in the laboratory did not impair germination.

A chemical and pathological study of decay of the xylem of the apple caused by Polystictus versicolor, R. G. SMITH (*Phytopathology, 14 (1924), No. 2, pp. 114–118*).—The results are given of chemical analysis of sound apple wood and apple wood attacked by *P. versicolor*.

Due to fungus attack a decrease was found in all constituents except benzene extract, lignin, and the undetermined constituents. Lignin showed a marked increase, and, since no new lignin could have been formed, the author believes that the increase is due to a concentration by removal of other constituents.

The study of resistance to crown-gall in Prunus, C. O. SMITH (*Abs. in Phytopathology, 14 (1924), No. 2, p. 120*).—A preliminary note is given of studies

on resistance to crown gall, a detailed account of the investigations having been noted (E. S. R., 54, p. 750).

Biological and cultural studies of Exoascus deformans, A. J. MIX (*Phytopathology, 14 (1924), No. 5, pp. 217–233, figs. 2*).—The author claims that *E. deformans* can be readily isolated from ascospore-bearing leaves and grown in a variety of common culture media. The minimum temperature for growth of the organism in culture is below 10° C. (50° F.), the maximum between 28 and 30°, and the optimum 20° or lower. The thermal death point of the fungus in culture was found to be 46°. Cultures were completely devitalized when kept for a few days at 30°. The organism is said to withstand drying on cover slips for 315 days. It has a wide toleration of acidity and alkalinity in culture media, growth occurring at H-ion concentrations below pH 3.3 and above pH 9.75.

Attempts to isolate the fungus from the surface of healthy peach twigs and buds and from the soil beneath infested trees were unsuccessful. A few successful isolations were made from the interior of diseased leaves and stems. Peach trees were successfully inoculated with conidia of the fungus from culture, and typical leaf curl resulted. The virulence of the fungus was not impaired by being kept in pure culture for 22 months. Attempts to inoculate very young seedlings grown from peach pits were very unsuccessful.

Notes on cranberry fungi in Massachusetts, N. E. STEVENS (*Phytopathology, 14 (1924), No. 2, pp. 101–107*).—A summarized account is given of an intensive study of the fungi associated with the decay of cranberries in Massachusetts. Fungi belonging to at least 25 genera have been isolated from decayed or sound cranberries, some of them only a few times, but more than one-third of the author's cultures yielded *Fusicoccum putrefaciens*. Other fungi which were also found 10 or more times in cultures were *Glomerella cingulata vaccinii*, *Phomopsis* sp., *Sporonema oxycocci*, *Guignardia vaccinii*, *Penicillium* spp., *Dematium* sp., *Pestalozzia guepini vaccinii*, *Acanthorhynchus vaccinii*, and *Alternaria* sp.

The effect of storage temperature, time required for development of disease in storage, distribution of infection by flood water, etc., are discussed.

Mosaic disease of loganberry, S. M. ZELLER (*Abs. in Phytopathology, 14 (1924), No. 2, p. 119*).—A destructive mosaic of loganberry is reported as occurring from Sonoma County, Calif., to Snohomish County, Wash. Nearly all the younger plantings are affected, and the plants are said to die in from three to four years after the first symptoms appear.

Grape rust in Florida, C. L. SHEAR (*Phytopathology, 14 (1924), No. 3, pp. 170–171*).—The occurrence of *Physopella vitis* on grapevines at Orlando, Fla., is reported, most of the varieties of grapes being practically defoliated.

Alternia rot of lemons, E. T. BARTHOLOMEW, (*California Sta. Bul. 408 (1926), pp. 3–32, pls. 3, fig. 1*).—A description is given of the Alternaria rot of lemons, the disease being compared with endoxerosis, or internal drying, with which it has been confused. The latter disease is said to be due to physiological causes.

Alternaria rot is reported to occur in all the lemon districts of California, and it probably causes more decay of lemon fruits than any other fungus with the possible exception of Penicillium. The author's investigations show that infection of the fruit may occur through the buttons or by spores or mycelium between the button and the fruit, and that infection occurs very early in the development of the fruit, but that decay does not begin until after the fruit is placed in storage.

Present methods of orchard spraying are said to be ineffective for the control of Alternaria rot, and the removal of the buttons and efforts at sterilization with fungicides were found to be inefficient and impracticable.

Picking the fruit before it is ripe and while it still retains a high degree of vitality, washing and thorough drying, and storage at a temperature of 55° F. or below are recommended as means for the control of this trouble.

Notes on the life history of the snapdragon rust, Puccinia antirrhini, E. B. MAINS (*Phytopathology, 14 (1924), No. 6, pp. 281–287*).—The author reports having obtained germination of the teliospores of *P. antirrhini* from five out of seven collections studied. Sowings of the germinating teliospores on young, rust-free snapdragons did not give infection in any case, and this is considered to indicate that the rust is heteroecious and has pycnia and aecia on an alternate host. It is considered that the most likely method of discovering this host is by observations in California on native species of Antirrhinum in localities where they are infected with the rust.

Herpetomonad flagellates in the latex of milkweed in Maryland, F. O. HOLMES (*Phytopathology, 14 (1924), No. 3, pp. 146–151, figs. 10*).—The author reports a flagellate infection of milkweed, probably *Asclepias syriaca*, discovered during the autumn of 1923 near Baltimore, Md. The flagellates are said to correspond fairly closely to those known as *Herpetomonas elmassiani*. So far as is known this is the first report of such organisms in the United States.

A red and black hemipterous insect (*Oncopeltus fasciatus*) is suspected of carrying the flagellates from plant to plant.

Decay of Douglas fir due to Poria incrassata, S. M. ZELLER (*Abs. in Phytopathology, 14 (1924), No. 2, p. 119*).—This fungus is reported to cause rapid and extreme damage to Douglas fir structural timber and flooring when there is contact with soil as a source of moisture.

Hypoxylon poplar canker, A. POVAH (*Phytopathology, 14 (1924), No. 3, pp. 140–145, fig. 1*).—A description is given of a canker of poplar trees discovered in Essex County, N. Y., and studied in 1920. A survey is said to have shown that more than 36 per cent of the quaking aspen trees were affected and 26 per cent of them killed by the disease.

Later the disease was found to occur in Maine and in Michigan. It is caused by *H. pruinatum*, which produces trunk cankers and finally kills the trees by girdling them. Young trees are said to be more susceptible than older ones, no infections having been found on trees more than 6 in. in diameter.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Animal ecology, with especial reference to insects, R. N. CHAPMAN (*Minneapolis, Minn.: Burgess-Brooke, 1925, pp. IX+187+183, figs. 125*).—The author here presents a mimeographed outline of a course in animal ecology, mainly for use of advanced students and investigators, based upon work offered at the University of Minnesota. Copious lists of references are included.

The value of life history studies from the viewpoint of systematic entomology, E. C. VAN DYKE (*Jour. Econ. Ent., 19 (1926), No. 5, pp. 703–707*).—This is a discussion presented at a joint meeting of the Pacific Slope Branch of the American Association of Economic Entomologists and the Pacific Coast Entomological Society.

The fundamental importance of life-history data in biological control work, H. S. SMITH (*Jour. Econ. Ent., 19 (1926), No. 5, pp. 708–714*).—The author discusses the ways in which a knowledge of the different phases of the life history of entomophagous insects is essential in biological control work.

The natural "cleaning up" habit of insects, D. C. Mote, J. Wilcox, and E. G. Davis (*Jour. Econ. Ent., 19 (1926), No. 5, pp. 745–748*).—In this contribution from the Oregon Experiment Station, the authors call attention to the habit of certain insects of passing their legs and antennae between their mouth parts and removing powdered materials in this manner. In an attempt to distinguish cleanliness from irritation as the incitant of this action, the western spotted cucumber beetle, German cockroach, European earwig, *Syneta albida* Lec., and the asparagus beetle were stimulated with sodium fluoride, calcium arsenate, lead arsenate, sodium fluosilicate, wheat flour, and powdered milk sugar.

Hippelates flies and certain other pests of the Coachella Valley, California, W. B. Herms (*Jour. Econ. Ent., 19 (1926), No. 5, pp. 692–695*).—It is pointed out that during the past 10 years *H. flavipes* Loew has become increasingly numerous in the Coachella Valley, which borders upon the Salton Sea and lies on an average of about 125 ft. below sea level. This fly is now a veritable pest and is believed to play a part in the transmission of the so-called pink eye affecting many of the inhabitants. The black widow spider (*Latrodectes mactans* Fab.) is said to occur in the valley in considerable numbers and to have been responsible for several serious cases of spider bite, one of which was fatal. The German cockroach is also increasing so rapidly that it is becoming a real pest.

[Entomological work at the Guam Station], S. R. Vandenberg (*Guam Sta. Rpt. 1925, pp. 17–19*).—The coconut scale (*Aspidiotus destructor*) has apparently existed in Guam since 1911, or even earlier, but has been held in check by natural enemies introduced with it. The present outbreak appears to have been due to the fact that the natural enemies were greatly reduced in numbers during the last two years, or that conditions arose greatly favoring the rapid multiplication of the scale. The pest was first discovered in the northwestern part of the island, whence it spread south and then east, where infestation was slight. In addition to the coconut it attacked breadfruit, papaya, banana, avocado, mango, guava, royal palm, lemon, orange, cassava, coffee, tomato, eggplant, taro, and many weed and brush plants. A brief account is given of its life history, followed by a discussion of control work. Four or five individuals of the ladybeetle *Lindorus lopanthae* were introduced in March, 1925, but were attacked by red ants and failed to become established. Three important natural enemies have been found in the island, including the small ladybeetle *Crytogonus orbiculus nigripennis*, the golden chalcid *Aphelinus diaspidis*, and a smaller and less numerous parasite attacking the male scale only, thought to be a form of *Aspidiotiphagus citrinus*. This ladybeetle is said to be widely distributed and, with the aid of control measures, has seemed to bring the scale under control in certain districts in the northern part of the island.

Other important insect pests briefly mentioned include the European corn borer, which has taken as high as 50 per cent of the corn crop, the sugar cane borer *Rhabdocnemis obscurus*, which also attacks the coconut palm, the rice bug of India *Leptocorisa varicornis*, and five or more species of mealybugs, which cause considerable damage.

[Report of the New York State Station division of entomology] (*New York State Sta. Rpt. 1926, pp. 36–44*).—In reporting upon studies of apple insects, it is stated that the major part of the work consisted in determining the susceptibility of the eggs and caterpillars of the fruit tree leaf roller to various insecticides, special consideration being given to field tests to ascertain the toxicity of oil sprays to the eggs. The results obtained indicate that the

homemade lubricating oil emulsion containing 8 per cent oil is an efficient ovicide, and that, if used as buds are swelling or not later than when green tissues show at the tips, a single application in occasional years produces apparently no permanent ill effects to the health of the trees. The oil treatment is thought to be warranted as an emergency measure in orchards where the crop at the time of picking shows from 15 to 20 per cent or more apples injured by the leaf roller.

Tests of commercial or proprietary miscible oils have indicated considerable variation in their killing properties, some having been much more effective than others. The results of experiments with arsenicals indicate that the leaf roller can be controlled with thorough and timely applications of such sprays, but one or two applications in addition to those provided in the standard spray schedule are necessary during the period when the eggs begin to hatch. Natural enemies, particularly an active hymenopterous parasite, *Trichogrammatomyia tortricis* Gir., are said to have destroyed many of the leaf rollers during the spring.

The studies of the life history of the codling moth showed that during a normal season there is one complete brood and a partial second brood of caterpillars that attack apple fruits. Along Lake Ontario the period of hatching of the first brood extends over a period of 7 weeks, and stings on the surfaces of apples can best be prevented by two cover sprays, one about 2.5 weeks and the other 5 weeks after the calyx period. The treatment for the second brood is advised for about the second week in August. At Geneva the codling moth appears earlier in the season, the hatching period generally being shorter than in the foregoing area, while the second brood is usually larger.

Lubricating oil emulsions containing no more than 2 per cent oil proved inefficient as ovicides, and, while heavy applications materially reduced the number of the nymphs, the oil sprays were not on the whole as effective as lime sulfur containing nicotine sulfate. Moreover, there are indications that oil emulsions regularly applied as a delayed dormant treatment may injure the trees. Reference is made to control work with the pear psylla which has been reported in detail in bulletins previously noted (E. S. R., 54, pp. 455, 456).

In discussing the control of sucking insects with dust mixtures, it is stated that the data indicate unmistakably that the San Jose scale, in the case of severely infested orchards, is not satisfactorily combated with sulfide dusts, which at first appeared to be the most promising material for a pest of this character. Calcium and sodium fluosilicates are mentioned as promising insecticides for use in dusting operations, and are being tested for the cucumber beetle and the codling moth. Finely gronnd tobacco is said to display very promising qualities as an aphiscide and seems destined to prove valuable in combating several species. Cherry fruit flies (*Rhagoletis* spp.) proved susceptible to dust mixtures containing nicotine as well as to applications of finely ground calcium cyanide, which opens up a new field of inquiry.

Reporting upon studies with grape insects, it is stated that the grape berry moth was so scarce in Chautauqua County that no field experiments could be conducted. Ecological investigations of this insect have shown that the foci of infestation in practically every instance where the pest was found were coincident with an area in which the snow cover during the previous winter had been practically continuous due to the drifting of snow, which indicates that a considerable degree of immunity to the pest can be secured by the avoidance of trees and other high objects adjacent to vineyards. During the summers of 1925 and 1926 considerable injury to grapes was caused by the climbing cutworms.

The most practical method of killing cucumber beetles thus far evolved has been to drive, by dusting, the pests from the main crop to the untreated squash seedlings. On the day following treatment the beetles may be killed on the traps by means of box fumigators, using a dust of 4 or 5 per cent nicotine content and an exposure of from 3 to 5 minutes.

In control work with aphids that injure cauliflower seed beds, laboratory tests of tobacco dusts of approximately 1, 2.5, and 5.5 per cent nicotine content showed that, under uniform conditions, the greater the nicotine content the more highly toxic the dust mixture, although the factor of time exposure had an important influence in determining the relative merits of tobacco with low nicotine content. The longer the exposure the more effective became such dust mixtures. *Macrosiphum solanifolii* Ashm. and the green peach aphid were numerous on potatoes for a short period during early July, but the unseasonably cool weather during the remainder of the month rapidly reduced their numbers to insignificant proportions. An application of nicotine spray at the strength of 1 pint of nicotine sulfate (40 per cent nicotine) to 100 gal. of water and of nicotine dust at the strength of 2 pints of nicotine sulfate (40 per cent nicotine) to 50 lbs. of hydrated lime, made when aphids were most abundant on the terminal shoots and leaves, resulted, under favorable circumstances, in a high rate of reduction provided the spray hit and the dust was placed within lethal range of the aphids. It appears that the satisfactory solution of the aphid problem is largely one of machinery and mechanics rather than of the comparative values of wet or dry forms of nicotine preparations. See also Technical Bulletin 121, noted below.

[Economic insects in Pennsylvania] (*Penn. State Hort. Assoc. Proc., 67 (1926), pp. 21–28, 37–39, 50–56*).—Papers presented at the annual meeting of the Pennsylvania State Horticultural Association held at Harrisburg in January, 1926, which relate to economic insects and their control, include the following: The Value of Oil Emulsion Sprays for Red Spider and the Rosy Apple Aphis, by H. E. Hodgkiss (pp. 21–28); The Oriental Fruit Moth, by S. W. Frost (pp. 37, 38); The Oriental Moth in Franklin County, by J. R. Stear (pp. 38, 39); Recommendations on Spraying Program for the Oriental Moth, by H. E. Hodgkiss (p. 39); and Should We Lift the Japanese Beetle Quarantine? by C. H. Hadley (pp. 50–56).

[Reports of the economic biologist of British Guiana], L. D. CLEARE, JR. (*Brit. Guiana Dept. Sci. and Agr. Rpts. 1923, pp. 47–51; 1924, pp. 65–68*).—These reports deal with the occurrence of the more important insects and control work conducted.

Recent introductions of beneficial insects in Hawaii, O. H. SWEZEY (*Jour. Econ. Ent., 19 (1926), No. 5, pp. 714–720*).—This is a contribution from the Hawaiian Sugar Planters' Experiment Station, in which an account is given of the introduction of beneficial insects during the period 1920–1925.

Further studies concerning the aphicidal properties of tobacco dust, H. C. HUCKETT (*New York State Sta. Tech. Bul. 121 (1926), pp. 3–29, figs. 4*).—This is an extended account of studies conducted from 1923 to 1925, in continuation of work previously noted (E. S. R., 49, p. 552).

In a comparative study under laboratory conditions, it was found that the higher the percentage of nicotine in tobacco dusts of fine quality, the greater the toxicity within limited periods of time throughout an experimental period of 1 to 7 days. Pure tobacco dust, or tobacco-hydrated-lime-dust mixtures, the tobacco of which contained approximately 1 per cent nicotine, under favorable conditions, varied in degree of toxicity according to the length of aphid exposure, 30-minute exposures being ineffective, while 3-hour exposures were attended with marked increase in the killing efficiency of such dusts. The

addition of hydrated lime to tobacco dusts of low or high nicotine content in a 50 to 50 proportion improved the physical properties of the dusts and rendered them more actively toxic. The dusts of low nicotine content showed the greater improvement by such additions, but hydrated lime in amounts greater than equal parts of each by weight proved detrimental. The addition of water to pure tobacco dusts had very little effect, if any, in improving the toxic properties of the dusts. The addition of water to dust mixtures of tobacco and hydrated lime had in all cases a marked effect in heightening the toxic value of such mixtures in the dry forms, whether determined immediately following such addition or after a period of 4 to 7 days' exposure. The amounts of water, whether 5, 10, 15, or 20 per cent, appeared to make relatively little difference, all cases being equally effective.

Under field conditions, tests were carried on with tobacco dust of approximately 1 per cent nicotine content upon aphids infesting cauliflower seedlings in the seed bed, earlier reports upon which have been noted (E. S. R., 53, p. 359; 54, p. 552). Tobacco-dust treatment gave superior results over other forms of nicotine treatment, due, it is thought, to the slower liberation of nicotine fumes in lethal quantities over an extended period of time, thus protecting the plants from daily reinfestation, and, also, to its fertilizer effect on plant growth. Tobacco dust diluted with hydrated lime in proportions equivalent to equal parts by weight affected the growth of the plants as favorably and controlled the aphids as effectively as pure tobacco dust.

Airplane dusting for the control of vegetable pests on the Mexican west coast, A. W. Morrill (*Jour. Econ. Ent., 19 (1926), No. 5, pp. 695–699*).—This is an abstract of an address by the author, an account of which has been noted from another source (E. S. R., 56, p. 57).

Technical aspects of petroleum oils and oil sprays, E. R. de Ong (*Jour. Econ. Ent., 19 (1926), No. 5, pp. 733–745*).—A discussion of the tests by which the character of petroleum oil may be designated, with special reference to volatility and sulfonation in evaluating oils to be used for sprays.

The use of oil spray on citrus trees, R. S. Woglum (*Jour. Econ. Ent., 19 (1926), No. 5, pp. 732, 733*).—This is an abstract of the author's paper presented at the annual meeting of the Pacific Slope Branch of the American Association of Economic Entomologists.

Fumigation with hydrocyanic acid gas: Concentration and distribution as influenced by fumigation procedure, B. J. Smit and T. J. Naude (*Union So. Africa Dept. Agr. Sci. Bul. 48 (1926), pp. 23, figs. 10*).—The authors' experiments show that in the pot method the generated gas rises rapidly to the highest part of the chamber and descends along the sides of the chamber to the floor.

"In the course of this movement every part of the chamber sampled receives a wave of gas stronger than that of the theoretical concentration. These strong concentrations, however, do not persist long, as in about 10 minutes after charging the distribution has become uniform all over the chamber. This rapid movement of the gas is caused by the heat of the reaction between the hot sulfuric acid and sodium cyanide, and by the steam rising from the generator.

"When in fumigations with liquid hydrocyanic acid the liquid is allowed to evaporate without heating or other aids to evaporation, the nature and area of the surface on which the liquid is poured has an important effect on the spread of gas. An unlimited smooth surface (cement) gives much more satisfactory results than a limited smooth surface (porcelain). An unlimited porous surface (air-dry soil) gives results much inferior to either of the preceding.

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"When the evaporation of hydrocyanic acid is aided by application of a moderate amount of heat the results obtained are practically the same as in the pot method."

Paradichlorobenzene as a soil fumigant, E. O. Essig (*California Sta. Bul. 411 (1926), pp. 3–20, figs. 10*).—Following a brief review of the literature, the author reports upon experiments with paradichlorobenzene (PDB) for the control of the western peach borer and other pests, started in 1921 and continued up to the time of writing. It is pointed out that in California the western peach borer attacks a variety of trees on different rootstocks, and that the problem is much more varied than in the eastern part of the United States, where only the peach budded on peach roots is affected. Its California hosts include the peach, cherry, prune, and apricot. Preliminary tests demonstrated the effectiveness of the treatment.

With prunes, the age of which trees varied from 4 to 25 years, the control of the borers averaged from 80 per cent to 95 per cent in most cases and in a few instances approached extermination for the season. During the past four years thousands of acres have been treated without the loss of a single tree or evident injury to any. With apricots, of which the majority of the older trees are on Mybrobalan rootstocks and very susceptible to borer attack, all ages of trees from those just set out to those 25 or 30 years old were treated. The only injury noted was to large roots which were close to the surface, some of which were either injured or killed by the gas and the trees greatly weakened. The dosage of PDB for control of the western peach borer is 1 oz. for an average tree. On very large trees it may be increased to 1.5 or 2 oz. Nursery stock treated by the furrow system should receive about 1 oz. to a linear yard of furrow. The material may be applied with fair success from May to November, but the best results have been secured from applications made in September and October.

Two years of experimental work with PDB on the pear root aphid (*Eriosoma lanuginosa* Hartig), conducted in Contra Costa County, proved the treatment to be efficacious on all ages of pear trees grafted to both French and Japanese rootstocks. Irrigation immediately after the application of PDB has not injured any of the thousands of trees treated. The dosage for control of this pest is from 1 to 1.5 oz. to a tree.

Experiments and demonstrations with PDB used at the rate of 1 to 1.5 oz. per tree for the control of the woolly apple aphid were conducted in Alameda, Sonoma, and Santa Cruz Counties, and the only injury thus far noted has been to trees having one or more rootstocks near the surface of the soil. The injury to appple trees reported from the East is not apparent in the work done to date in California.

More than a hundred separate patches of raspberry and blackberry plantings on light and heavy soils in the San Fernando Valley were treated for the control of *Bembecia marginata* Harris between June 7 and July 17 at the rate of 0.5 oz. for the smaller plants and 0.75 oz. for the larger ones. The gas treatment did not injure the bushes, as has been reported to be the case in New Jersey.

This insecticide was used against the grape phylloxera at the rate of 8 to 16 oz. to a vine, applied in furrows radiating from the vines. Some of the vines showed injury soon after the treatment, but subsequent examination of the roots of the treated vines showed no evidences of phylloxera while roots from the check vines showed great numbers present. The following spring the phylloxera were found on the roots of the treated vines in limited numbers, but the injured vines made a noticeable advance in growth over the infested

untreated vines in the same vineyard. In an experiment conducted in July in which 0.5 oz. of PDB was used to a vine, examination in November showed practically no control on the light soil while no insects could be found on the vines in the heavier soil.

In control work with wireworms in dahlia roots, the results of preliminary work with PDB were so promising that an entire patch was treated. The retarded plants at once took on new life, and an excellent crop of flowers was produced in the face of what seemed sure ruin. The dosage used was about 1 teaspoonful placed about 2 in. above the planted tuber. Since only a few dead wireworms could be found in the soil, it was concluded that the chemical acted chiefly as a repellent, but it was so effective that not a single living wireworm was found in any of the several hundred tubers treated.

In control work with the garden centipede *Scutigerella immaculata* Newport on asparagus unsatisfactory results were obtained, due apparently to the rapid escape of the vapor because of the porous condition of the peaty soils where the tests were made.

Naphthalene fumigation of greenhouses, A. HARTZELL (*Jour. Econ. Ent., 19 (1926), No. 5, pp. 780–786, fig. 1*).—Fumigation with commercial flake or ground naphthalene at a concentration of 1.5 oz. per 1,000 cu. ft. of air space with exposures lasting overnight proved to be an effective and practical method for controlling red spider (*Tetranychus telarius*), *Heliothrips femoralis*, and the onion thrips in greenhouses. It is pointed out that observations covering a period of two years in which the tolerance of 40 species of plants was repeatedly tested indicate that this fumigant is adaptable to general greenhouse use.

The control of grasshoppers by airplane dusting, A. A. GRANOVSKY (*Jour. Econ. Ent., 19 (1926), No. 5, pp. 791–795*).—This is a brief review of some Russian literature with reference to the control of the migratory grasshoppers, *Locusta migratoria* L. and *Calliptamus italicus* L., by airplane dusting. It is pointed out that several arsenical dusts have been tried experimentally with varied results. Disodium acid arsenite and disodium acid arsenate dusts were used with striking success against hoppers when they were on the wing, indicating that certain arsenicals can probably be used as contact insecticides.

Control experiments on the Surinam cockroach (Pycnoscelus surinamensis L.), C. F. DOUCETTE and F. F. SMITH (*Jour. Econ. Ent., 19 (1926), No. 4, pp. 650–656*).—The authors report upon a study made of the habits of this tropical cockroach, which has been found doing injury in several greenhouses in the eastern part of the United States. Experiments conducted to determine practical control measures adaptable in commercial greenhouses are reported upon. The work with poison baits indicates that their use over large areas would be impractical. Sodium cyanide in solution applied to the soil was the most promising control material used.

Notes on the recent outbreak of Toxoptera graminum, C. N. AINSLIE (*Jour. Econ. Ent., 19 (1926), No. 5, pp. 800, 801*).—In the course of this discussion it is pointed out that portions of the State of Minnesota, a region heretofore supposed to lie too far north for any general increase of the green bug, were the scene of unusual damage by it during the spring and summer of 1926.

Crepe myrtle plant louse, H. L. DOZIER (*Jour. Econ. Ent., 19 (1926), No. 5, p. 800*).—The author considers the plant-louse enemy of the crepe myrtle, perhaps the most widely used ornamental shrub throughout the Gulf States, to be no other than *Myzocallis kahawaluakolani*, described by Kirkaldy from Honolulu. It is pointed out that at times this aphid renders the foliage of the crepe myrtle unsightly by the black sooty mold that grows in its "honeydew"

excretion. The ladybeetle *Olla abdominalis sobrina* Casey and a species of Chrysopa are important enemies of the pest in the Gulf Coast section.

The pea aphid as an alfalfa pest in California, C. M. PACKARD and R. E. CAMPBELL (*Jour. Econ. Ent., 19 (1926), No. 5, pp. 752–761*).—The data here presented have been noted from another source (E. S. R., 55, p. 153).

The peach cottony scale, P. J. PARROTT and S. W. HARMAN (*New York State Sta. Circ. 89 (1926), pp. 8, pls. 2*).—This is a practical summary of information upon the peach cottony scale (*Pulvinaria amygdali* Ckll.), a comparatively unknown pest which during the past two years has become very destructive to peach orchards in western New York, being most conspicuous in plantings in Wayne, Monroe, Orleans, and Niagara Counties that are within a range of from 5 to 7 miles of the shore of Lake Ontario. The circular presents a description of the insect, an account of its life history and habits, and information on the nature of its injury to peach trees, control measures, lubricating oil emulsions, factory-made lubricating oil emulsion, commercial miscible oils, combinations of fungicides with lubricating oil emulsion, timing of the application, and precautions for prevention of oil injury.

In 1925 the hatching of the eggs, the number of which ranges from 800 to as high as 3,000 and upwards per insect, was well under way by June 11 and apparently completed by July 1, but in 1926, due to weather conditions, hatching was not completed until July 27. Upon hatching out the young scales swarm over the trees, establishing themselves on the tender bark near the tips of the succulent shoots, or preferably along the midribs and veins of the leaves. In the fall migration from the leaves to the twigs takes place. Its injury is caused by the abstraction of sap and the smutting of the fruit and leaves.

In control work oil mixtures have proved most effective. The homemade lubricating oil emulsion devised by the U. S. D. A. Bureau of Entomology, consisting of red engine oil 2 gal., water 1 gal., and potash fish oil soap 2 lbs., is considered from the standpoint of economy to be about the cheapest oil spray available. The boiled homemade oil emulsions are preferred by the author to the cold-mixed homemade emulsions, since they are, on the whole, more stable. Attention is called to the fact that factory-made lubricating oil emulsions which have great stability and uniform strength are now on the market. During the spring, lubricating oil emulsion applied in combination with Bordeaux mixture for the control of leaf curl effectively controlled the scale.

Notes on some Lepidoptera from eastern Texas, L. J. BOTTIMER (*Jour. Agr. Research [U. S.], 33 (1926), No. 9, pp. 797–819, figs. 3*).—This account is based upon collections, observations, and rearings of Lepidoptera from eastern Texas made by the Federal Horticultural Board in the latter part of 1922 and again in 1923, in connection with the eradication work with the pink boll worm. The work was conducted with a view to discovering host plants of the pink boll worm other than cotton and to enlarging the list of Lepidoptera likely to be mistaken for this comparatively new cotton pest. Of the 40 species of Lepidoptera listed, *Chaetocampa crotonella, Isophrictis rudbeckiella, Recurvaria eryngiella,* and *Gelechia monotaeniella* are described as new, and 2 already described are here recorded for the first time from the United States. The variety *I. similiella denotata* is also described as new, and the genus Chaetocampa has been erected by Busck. The paper has been confined largely to new species and to previously unrecorded data regarding the habits and distribution of other forms. The paper supplements an account by Heinrich, previously noted (E. S. R., 45, p. 156).

The biology of the Lepidoptera, M. Hering (*Biologie der Schmetterlinge. Berlin: Julius Springer, 1926, pp. VI+480, pls. 13, figs. 82; rev. in Ent. News, 37 (1926), No. 9, pp. 309–312*).—This work deals at length with the various phases of the life history and habits of the Lepidoptera. The first part takes up the ontogenesis (pp. 44–116); the second part deals with the adults, their nutrition, reproduction, senses, and flight (pp. 117–222); and the third part deals with general problems (pp. 223–468). A list of 48 references to the literature and indexes to the genera and subject matter are included. The review is by W. T. M. Forbes.

The peach and prune root-borer injurious to cherries, B. G. Thompson (*Jour. Econ. Ent., 19 (1926), No. 5, pp. 779, 780*).—Notes are presented on the injury, life history, and parasites of *Synanthedon opalescens* (H. Edw.), which was found only in the roots and crown below the union of the bud and root in cherries budded to *Prunus mahalab* rootstock.

Some possibilities in codling moth control, G. M. List (*Jour. Econ. Ent., 19 (1926), No. 5, pp. 748–752*).—Attention is called to the fact that under some conditions spraying alone is not proving satisfactory, and that the use of bands, orchard sanitation, and the picking of wormy fruit should be practiced. Ovicides are said to show possibilities as a means of reducing the number of stings, oils having proved the most efficient. It is possible to trap large numbers of adult codling moth, and a fermenting sweetened apple juice is proving a valuable attractant. The traps can be used as a means of determining the insect development in an orchard for the establishment of spray dates.

Codling moth attacks cherries, D. C. Mote (*Jour. Econ. Ent., 19 (1926), No. 5, pp. 777, 778*).—In this contribution from the Oregon Experiment Station, the author records the rearing of codling moth from larvae feeding on cherries from three different counties of the State.

The oriental peach moth, A. Peterson and G. J. Haeussler (*U. S. Dept. Agr., Dept. Circ. 395 (1926), pp. 28, figs. 17*).—This is a summary of information on the status of knowledge of the pest, including control measures. A table showing the number of broods of moths of the oriental peach moth and dates of emergence of the first and last adults of each brood for several localities, including Fort Valley, Ga., Leesburg, Va., Riverton and New Brunswick, N. J., Chambersburg, Arendtsville, and Harrisburg, Pa., and New Haven, Conn., is contained in the account.

Observations on the characteristic injury caused by the Lima bean pod borer, Etiella zinckenella Treit., and other insects with which its injury is confused in California, A. O. Larson (*Jour. Econ. Ent., 19 (1926), No. 5, pp. 699–702*).—This is an account of the characteristic appearance, before and after harvest, of beans cut by *E. zinckenella*, as well as that of beans injured by other caterpillars and bean weevils.

Tobacco cutworms and their control, S. E. Crumb (*U. S. Dept. Agr., Farmers' Bul. 1494 (1926), pp. II+14, figs. 11*).—This is a practical summary of information on the subject.

The use of powdered larvicides in combating mosquitoes [trans. title], E. Roubaud (*Bul. Soc. Path. Exot., 19 (1926), No. 4, pp. 287–302, figs. 3; abs. in Rev. Appl. Ent., 14 (1926), Ser. B, No. 7, pp. 121, 122*).—Tests made of trioxymethylene, arsenical powders, and a proprietary preparation are reported upon. Applied in equal volume in the proportion of 5 per cent in an inert powder, calcium arsenite appeared to be the most active, followed by acetoarsenite of copper. The proprietary preparation Stoxal is most highly recommended for use on a large scale, due to its rapidity of action and harmlessness for other forms of life. Its effectiveness is more lasting than the others (as

long as 20 hours after contact with the water), and its action is quicker than that of the arsenicals.

The horse bots and their control, F. C. Bishopp and W. E. Dove (*U. S. Dept. Agr., Farmers' Bul. 1503 (1926), pp. 11+14, figs. 8*).—This is a practical summary of information on the subject.

The lesser bulb fly, Eumerus strigatus Fallen, in Oregon, J. Wilcox (*Jour. Econ, Ent., 19 (1926), No. 5, pp. 762–772, pl. 1, figs. 3*).—In this contribution from the Oregon Experiment Station the author reports that the lesser bulb fly, which was first reported from Oregon in 1918, is now established in the commercial onion and narcissus producing sections of the State.

The cherry fruit fly, H. Glasgow and F. L. Gambrell (*New York State Sta. Circ. 87 (1926), pp. 10, figs. 3*).—This practical account, mentioned in the report noted on page 251, deals with the life history, control, and supplementary control measures. A chart showing the life history of the pest in relation to the development of the cherry crop and a cherry spray schedule in tabular form are included.

Water and water solutions of organic compounds as dips for the soil of potted plants infested with the Japanese beetle, W. E. Fleming (*Jour. Agr. Research [U. S.], 33 (1926), No. 9, pp. 821–828*).—This is a report of investigations conducted at the Japanese Beetle Laboratory at Riverton, N. J., in which experiments were made to determine whether an established infestation of the Japanese beetle in the soil of small potted plants could be destroyed by submersion for a definite period in water or water solutions (emulsions) of o-cresol, phenol, benzyl chloride, carbon disulfide, nitrobenzene, and sodium cyanide.

"The larvae resisted asphyxiation in water for 15 days. No correlation was found between the rate of larval mortality and the concentration of the dissolved oxygen of the water. Carbon disulfide emulsion was the most effective of the solutions in killing the larvae in the submerged soil. The insecticidal concentrations, however, usually injured plants. It was apparent in these experiments that the effective action of any dipping solution is so dependent upon soil imbibition, soil adsorption, and soil absorption as to limit the application of even an effective insecticide to conditions where these factors are favorable."

A list is given of 20 references to the literature.

A contact spray for the control of the Japanese beetle (Popillia japonica Newm.), E. R. Van Leeuwen (*Jour. Econ. Ent., 19 (1926), No. 5, pp. 786–790*).—This contribution from the Japanese Beetle Laboratory at Riverton, N. J., deals with an emulsion of oleoresin of pyrethrum flowers and sodium oleate as a contact spray for the control of the Japanese beetle. The experiments include laboratory and field tests on various types of plants for injury and toxicity tests on the beetle.

The cadelle, E. A. Back and R. T. Cotton (*U. S. Dept. Agr. Bul. 1428 (1926), pp. 42, figs. 15*).—This is a summary of information on the status of knowledge of this pest, based on a review of the literature, in connection with a list of 35 references, and investigations conducted. Much of the data on the biology of the species is presented in tabular form.

The Arizona cotton boll weevil problem, T. P. Cassidy (*Jour. Econ. Ent., 19 (1926), No. 5, pp. 772–777*).—This is a brief discussion of the boll weevil on Thurberia or wild cotton and its relation to the cultivated crop by an agent of the U. S. D. A. Bureau of Entomology.

The problem of insects injurious to alfalfa, S. B. Doten (*Nevada Sta. Rpt. 1925, pp. 16, 17, fig. 1*).—Tests showed spraying and dusting with arseni-

cals to be highly effective against the alfalfa weevil. The application of arsenicals by dusting was much more feasible than as sprays. Good results were obtained with both methods, although spraying seemed to be somewhat more effective. The tests of the year showed clearly that horse-drawn sprayers are effective and useful in this type of spraying, more so than the gasoline-power sprayer that was tested. A bulletin by Snow covering the spraying tests of the years 1923 and 1924 has been noted (E. S. R., 53, p. 454).

The collection and utilization of pollen by the honeybee, R. L. Parker (*New York Cornell Sta. Mem. 98 (1926), pp. 3–55, figs. 16*).—The first part of this account deals with the collection of pollen (pp. 6–30), and is followed by an account of the utilization of pollen (pp. 30–49). Both are preceded by a review of the literature on the subject in connection with a bibliography of six pages.

The author finds that pollen alone is collected from relatively few plants, the majority of species visited yielding both nectar and pollen. Of all the bees observed 25 per cent collected pollen only, 17 per cent gathered both pollen and nectar on the same trip, and 58 per cent collected nectar alone. It was found that bees gathering nectar utilize pollen from the same species of plant from which they are gathering nectar. The average pollen load is nearly 20 per cent of the weight of the carrying bee, or 0.0150 gm., while the large loads weigh 0.0197 gm. The availability of pollen is influenced by relative humidity and temperature. With some plants the period is limited to the early morning while other plants yield more or less pollen all day. Pollen is gathered at all times when it is available whether or not it is needed immediately.

Pollen was found to be the chief source of protein in the food of bees, a lack of it causing a cessation or a slackening of brood rearing, while pollen coming to the hive acted as a stimulus to brood rearing. When there was a plentiful supply of pollen in the hive and other conditions were favorable brood rearing progressed rapidly. During the period of mass feeding royal jelly is supplied abundantly, and during the period of progressive feeding undigested pollen is mixed with the food derived from a secretion. Pollen tubes, such as appear in germinating pollen, have not been seen in pollen within the digestive organs of the bee, but grains which were cracked or have a part of the wall missing were often found. Substitutes for pollen, such as rye, wheat, oats, pea meal, corn, buckwheat ground fine, and Mellin's Food, were not found to be beneficial. Larvae fed these foods die just after the period of mass feeding.

The reappearance of Harmolita grandis and Harmolita vaginicola in Utah, R. W. Doane (*Jour. Econ. Ent., 19 (1926), No. 5, pp. 730–732*).—The author reports that the wheat-straw worm and the wheat-sheath worm (*H. vaginicola* Doa.), both of which were destructively abundant in Utah in 1914 and 1915, have been much less abundant during the past 10 years, but in 1926 they again appeared in sufficient numbers to destroy some fields and affect others seriously.

Habrobracon brevicornis Wesm., P. Genieys, trans. by L. O. Howard (*Ann. Ent. Soc. Amer., 18 (1925), No. 2, pp. 143–202, figs. 35*).—This deals with the effect of environment and the variations which it produces, and with the biology and the morphology of the insect.

A study of some hymenopterous parasites of aphidophagous Syrphidae, M. Kamal (*Jour. Econ. Ent., 19 (1926), No. 5, pp. 721–730*).—This paper summarizes the results of investigations by the author during the past two years on the parasites of the aphid-feeding Syrphidae of southern California.

Hereditary transmission of tularaemia infection by the wood tick, Dermacentor andersoni Stiles, R. R. PARKER (*Pub. Health Rpts. [U. S.], 41 (1926), No. 28, pp. 1403–1407*).—Experiments are recorded which demonstrate the hereditary transmission of *Bacterium tularense* in the intermediate tick host *D. andersoni* (=*D. venustus*). Eight of 15 females engorged on infected hosts transmitted infection to their progeny.

ANIMAL PRODUCTION

The digestibility of certain fruit by-products as determined for ruminant.—I, Dried orange pulp and raisin pulp, S. W. MEAD and H. R. GUILBERT (*California Sta. Bul. 409 (1926), pp. 3–11, figs. 3*).—The average digestibility of dried orange pulp and raisin pulp when fed with alfalfa hay as determined with 5 wethers according to usual methods is reported in the following table:

Coefficients of digestibility of dried orange and raisin pulp

Kind of feed	Dry matter	Crude protein	Ether extract	Crude fiber	Nitrogen-free extract
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Dried orange pulp	89.33±0.31	78.54±0.35	48.89±1.44	83.73±1.61	95.40±0.17
Raisin pulp	44.78± .64	24.13± .40	90.16± .24	18.54± .55	52.01±1.10

Estimates of the feeding value, based on the digestibility studies, indicated that dried orange pulp was comparable to barley, dried beet pulp, and other feeds of a similar nature, while rasin pulp had approximately two-thirds of the feeding value of these feeds.

Commercial feeding stuffs in Kentucky in 1925, J. D. TURNER, H. D. SPEARS, W. G. TERRELL, and P. H. SENN (*Kentucky Sta. Bul. 268 (1926), pp. 97–137*).—A summary of the official analyses of feeding stuffs, giving the manufacturer's name, kind of feed, and number of samples equal to or below their guaranty (E. S. R., 53, p. 269.)

The effect of feeding cellulose on the pulse rate of steers, H. W. TITUS (*Jour. Agr. Research [U. S.], 33 (1926), No. 9, pp. 887–891*).—The pulse rate taken just before watering at 10 a. m. and 3 p. m. of the steers used in the study of the effect of fiber on digestibility at the New Mexico Experiment Station (E. S. R., 56, p. 159) showed that as the content of paper pulp in the alfalfa hay ration was increased there was a marked tendency for the pulse rate to increase. This increase was found to be proportional to the increased apparent digestibility of the paper pulp as compared with alfalfa.

It is suggested that a refined method for determining pulse rate over a long interval might be a rather accurate index of metabolic activity.

Fattening steer calves: Corn and oilmeal in dry-lot rations, previous to feeding on grass, G. BOHSTEDT (*Ohio Sta. Bimo. Bul., 11 (1926), No. 6, pp. 217–224, figs. 3*).—Four lots of ten steer calves were used for comparing the rations fed to heifer calves in the previous trial (E. S. R., 54, p. 361). During the 161-day dry lot feeding period those receiving the basal ration of alfalfa hay and corn silage made an average daily gain of 1.37 lbs. With the supplement of 2 lbs. of oil meal per head daily to this ration the average daily gain was increased to 1.87 lbs. When the basal ration was supplemented with both corn and linseed oil meal the average daily gain was 2.12 lbs., and when the corn was fed only during the last 13 weeks of the feeding period the average

daily gain was 2.07 lbs. From the results of the dry lot feeding it appeared that, as in previous experiments, the more corn that was fed in the ration the greater were the calculated returns over feed costs.

At the conclusion of the dry lot feeding period all lots were fed on corn and oil meal with blue grass pasture. When first turned on pasture all lost in weight, but the corn-fed calves lost much more and required a longer time to regain the lost weight. It is pointed out that it would have been more economical to have sold the corn-fed cattle directly after the dry lot winter feeding period.

The average daily gains made during the pasturing period of 84 days for those which in dry lot had received the basal ration, the basal ration plus oil meal, the basal ration plus corn and oil meal, and the basal ration plus oil meal with corn during the last 13 weeks were 1.60, 1.16, 0.91, and 0.97 lbs., respectively.

After finishing, the cattle were slaughtered. The carcasses were all considered as very desirable for the butcher's trade because of the small amount of waste.

Stanchion-feeding compared with group-feeding of baby beeves, G. Bohstedt (*Ohio Sta. Bimo. Bul., 11 (1926), No. 6, pp. 225–229, figs. 3*).—Two lots of baby beef calves were full-fed for 203 days on a ration of corn and linseed oil meal 9:1 with alfalfa hay and corn silage. During the first 98 days one of the lots was fed as a group, while the calves of the other lot were individually fed in stanchions. The method of feeding the two lots was reversed during the last 105 days of feeding.

In the first period the calves fed in stanchions made an average daily gain of 2.38 lbs. per head as compared with 2.66 lbs. for the group-fed calves. During the second feeding period the group-fed calves made an average daily gain of 1.85 lbs. as compared with 1.27 lbs. for those fed in stanchions. The explanation of the greater gains of the group-fed calves was that during the first 98 days the group-fed calves ate an average of 0.41 lb. more grain, 0.95 lb. more hay, and 2.18 lbs. more silage per head daily than the stanchion-fed calves, with somewhat greater differences in the second period.

From these results it is concluded that feeding as a group tends to stimulate the feed consumption and increase the rate of gain and the margin over feed cost.

[Experiments with beef cattle at the Illinois Station] (*Illinois Sta. Rpt. 1925, pp. 68–71, fig. 1.*)—The results of the following experiments are briefly reported:

Corn Belt rotation will maintain beef herd.—Five years' results on this project by H. P. Rusk (E. S. R., 54, p. 359) have shown that a good stand of sweet clover will furnish approximately 170 days of pasture per acre when grown in the rotation of corn, corn, oats, and sweet clover, while good blue grass pasture yielded only 101 days' pasturage per acre.

Soft corn found valuable for fattening steers.—In an experiment conducted by Rusk, R. R. Snapp, and J. H. Knox, 6 lots of 10 2-year-old steers fed soft corn by different methods in conjunction with oil meal and alfalfa hay for 90 days made average daily gains as follows: Shock corn 3.05 lbs., ear corn silage 3.35 lbs., broken ears from the field as needed 3.12 lbs., corn pastured in the field 3.29 lbs., ear corn silage plus oats 3.42 lbs., and hard ear corn from the previous year 3.55 lbs. The steers fed broken ear corn from the field dressed 61.6 per cent, while the steers in the other lots dressed 62.2 per cent.

Studies by S. Bull and J. H. Longwell of the carcasses of the steers inspected by several packing house men and retail meat dealers indicated that all pre-

ferred those from the cattle receiving sound corn. The marbling and coloring of the beef was much better than from those fed on soft corn, and in addition the meat was firmer. Chemical analyses of the ribs, however, showed no differences in the water and fat contents or in the palatability of the beef produced on soft and hard corn.

Feeding bone meal to range cattle on the Coastal Plains of Texas, H. SCHMIDT (*Texas Sta. Bul. 344 (1926), pp. 3-37, figs. 5*).—Following a general summary of animal requirements for minerals the results of feeding mineral supplements to range cattle are reported. By making regular tests of the desire of cattle to chew bones it was found that this habit could be broken by allowing cattle on pasture access to a mineral mixture of 2 parts of bone meal and 1 part of salt. Considerable time was required to overcome the habit, especially in certain individuals, and two cows which would not eat the minerals could not be broken of the habit of bone chewing. The loss of animals and the necessity of furnishing supplemental feed was considerably greater in cattle not receiving the mineral supplement. The gains of the cattle, the numbers of calves reared, and their weights at weaning were considerably better for lots receiving the mineral mixture, and practically no cases of creeps developed, though this condition was common in the control lots.

Efforts to use ground rock phosphate alone or in mixture with salt and bone meal were entirely unsuccessful. Bone meal alone was also refused by the animals.

[Nutrition studies with sheep at the Illinois Station] (*Illinois Sta. Rpt. 1925, pp. 73-75*).—Brief results of the following feeding and nutrition experiments are reported:

Check made on energy values of sheep feeds.—In continuing the study of the energy value of roughages by W. G. Kammlade, H. H. Mitchell, and T. S. Hamilton (E. S. R., 54, p. 361), 4 lots of 5 sheep each were used for determining the amount of timothy, clover, or alfalfa hay or oat straw required to maintain body weight when fed with minerals and 0.14 lb. of linseed oil meal daily per 100 lbs. of live weight. There were required 1.896 lbs. of alfalfa, 1.781 lbs. of clover, and 1.517 lbs. of timothy hay per 100 lbs. of live weight for maintenance in these experiments. The high value, 1.488 lbs., for oat straw was attributed to the fact that some of the sheep would not eat sufficient straw to maintain body weight. The relative nutritive values of these feeds were found to agree more closely with Armsby's net energy values than with Henry and Morrison's values for total digestible nutrients.

No losses caused by soy bean hay fed to ewes.—In a comparison by Kammlade of alfalfa and soy-bean hay for pregnant ewes, one lot received 3.12 lbs. of alfalfa hay per head per day until lambing time, while the other lot received 3.77 lbs. of soy-bean hay. The amounts of the respective hays refused averaged 1.7 and 15.2 per cent. The same kind of hay supplemented with grain was fed after lambing to both ewes and lambs.

There was no apparent injurious effect resulting from the feeding of the soybean hay to pregnant ewes or lambs, and the gains made by the lambs were comparable with those produced in the alfalfa-hay lot, though somewhat more hay was consumed in the soy-bean lot.

[Experiments with sheep at the Nevada Station] C. E. FLEMING (*Nevada Sta. Rpt. 1925 pp. 18, 19*).—The results of experiments in continuation of those previously noted (E. S. R., 53, p. 467) are briefly reported.

The problem of producing more and better lambs in Nevada range flocks.—Several years' repetitions of this test have indicated that it is possible to increase materially the yield of wool and the weight and uniformity of the

lamb crop by progressive improvement in the type of bucks used in range flocks.

The problem of producing pasturage for sheep under western Nevada conditions.—By dividing the pasture into paddocks which were grazed successively 96 ewes and 120 lambs were pastured for 119 days on 9.9 acres of blue grass and common white clover. When the soil was soaked with irrigation water the sheep were removed. It is pointed out that the carrying capacity of grazing pastures depends directly upon the way in which they are managed.

Progress of reindeer grazing investigations in Alaska, L. J. Palmer (*U. S. Dept. Agr. Bul. 1423* (*1926*), *pp. 37, pls. 18, figs. 3*).—This bulletin reports the progress in reindeer investigations in Alaska which has been made since the publication of Department Bulletin 1089 (E. S. R., 48, p. 70). The different types of animals and the methods of handling and training sled reindeer have been studied.

In tests with cultivated grains and grasses such feeds have proven as satisfactory as the native lichen forage. Studies of the forage cover have shown that lichens are seldom present in pure stand, though they are the main forage for winter grazing. A rapid change in the flora has been found to follow close grazing of the lichens. One denuded area regained 50 per cent of its former stand in 4 years, and the time required for a normal stand appears to range from 7 to 30 years, depending upon the area. The studies so far have indicated that winter grazing requires 30 to 45 acres per head, while summer grazing requires 10 to 15, or a total of 40 to 60 acres are required for grazing purposes for an animal per year.

Better methods of herd management and provisions for transportation and marketing of the meat appear to be the lines of attack for most encouraging progress in the reindeer industry in the future.

[**Experiments with swine at the Illinois Station**] (*Illinois Sta. Rpt. 1925, pp. 55–57, 59, 60*).—The results of the following experiments are briefly reported:

Intermediate pigs still superior in type test.—Continued studies of swine type by R. J. Laible, R. A. Smith, S. Bull, and J. H. Longwell (E. S. R., 54, p. 363) have generally agreed with earlier results. Two lots each of the intermediate and rangy types were used in the experiment, one lot of each type being individually hand-fed corn, middlings, tankage, and alfalfa meal, while the other two lots were self-fed a mixture of corn, middlings, and tankage with alfalfa pasture. The differences in the rate and economy of gains made by the two types under both methods of feeding were not significant, but there was a slight advantage for the intermediate type in the age and weight at which marketable finish was attained. Studies of the finished carcasses showed that when 37 per cent or more fat can be separated with the knife the carcass is finished. A larger percentage of the intermediate pigs were finished according to this test at 225 lbs. live weight. Cutting tests showed that there was a slightly larger percentage of fat cuts from the intermediate type carcasses than from those of the rangy pigs. The percentage of fat in the self-fed pigs of both types was approximately 6 per cent greater than in similar hand-fed animals. The 3 years' results indicated the superiority of the intermediate-type animals over those of the rangy type from the butcher's standpoint, but the difference was less when the animals were finished by self-feeding.

Fattening pigs do well when fed soft corn.—In a 33-day test conducted by Laible and Smith three lots of pigs were fed on a mixture of 50 per cent of tankage, 25 per cent of linseed oil meal, and 25 per cent of alfalfa meal with ear corn silage, soft ear corn, and sound ear corn in the different lots. There

was practically no difference in the average daily gains, 0.54 and 0.52 lb., in the lots receiving soft ear corn and sound ear corn, respectively, and similar results were obtained in regard to the feed required per 100 lbs. of gain calculated to a uniform basis of 14 per cent of moisture. The ear corn silage, however, proved unsatisfactory, as a gain of only 0.27 lb. per day was made and the amount of feed required per unit of gain was very high.

Crossbreds versus purebreds in producing market hogs, P. S. SHEARER, J. M. EVVARD, C. C. CULBERTSON, ET AL. (*Iowa Sta. Leaflet 20 (1926), pp. 11*).—The data are presented on 5 litters of pigs from birth to 225 lbs. live weight produced by double matings of purebred Poland China sows with Duroc Jersey and Poland China boars. Among these pigs there were 31 crossbreds and 21 purebreds. At birth the purebreds were slightly heavier, averaging 2.89 lbs., as compared with 2.66 lbs. for the crossbreds, but 67 per cent of the purebreds were classified as very strong, while 71 per cent of the crossbreds were so classified. Of those born dead, 9.5 per cent were purebreds, while only 3.2 per cent were crossbreds, though in the latter group there were 10 per cent weak pigs, while none of the purebreds were classified as weak.

Both purebreds and crossbreds were allowed to run together in the litters with their dams until weaning, during which time the crossbreds made an average daily gain of 0.599 lb. as compared with 0.555 lb. for the purebreds. The same percentage of pigs were saved to weaning in both types, but in body measurements the crossbreds made somewhat better gains.

After weaning, the crossbreds and purebreds were separated and self-fed on shelled corn plus a supplemental protein mixture of tankage, corn oil cake meal, and alfalfa meal 2:1:1 with minerals. During this feeding period the crossbreds generally excelled the purebreds in rate of gain, capacity for feed consumption, economy of utilization of feed, calculated profits over feed costs, and in body growth as determined by various measurements.

[Swine feeding experiments at the Guam Station], C. W. EDWARDS (*Guam Sta. Rpt. 1925, pp. 4–8, figs. 3*).—In a 45-day test nine 80 to 85-day-old pigs were self-fed free choice on coconut meal, cracked corn, and tankage supplemented with minerals. A total of 258 lbs. of feed was required per 100 lbs. of gain, the average daily gain per pig being 0.936 lb. The ration as consumed consisted of 12.25 per cent of tankage, 50.77 per cent of corn, and 36.98 per cent of coconut meal.

In another test, lasting 80 days, five boars averaging 84 lbs. in weight were placed on Para grass with access to a self-feeder containing coconut meal and minerals. An average daily gain of 1.12 lbs. was made, and 343 lbs. of feed were required to produce 100 lbs. of gain.

In another experiment, lasting 80 days, six 29-lb. pigs were given free access to a self-feeder containing cracked corn and coconut meal with minerals. An average daily gain of 0.579 lb. per head was made on this ration with a feed consumption of 297 lbs. per 100 lbs. of gain.

In a fourth experiment 9 grade sows averaging 125 to 130 days of age were self-fed during a 60-day period on a ration consisting of coconut meal and cracked corn with Para grass pasture. An average daily gain of 1.08 lbs. per head was made on this ration with a feed consumption of 362 lbs. per 100 lbs. of gain.

General results of these experiments have demonstrated the value of tankage as a feed for pigs during at least a period following weaning. The results have also shown that no harm was associated with the feeding of coconut meal as the entire concentrate ration. Larger amounts of coconut meal were consumed in connection with a ration of corn in self-feeders than are generally recommended.

Corn Belt rations for fattening spring pigs on pasture and in dry lot, J. M. Evvard, C. C. Culbertson, W. E. Hammond, and C. F. Bassett (*Iowa Sta. Leaflet 19 (1926), pp. 16*).—In making a study of various rations for pasture and dry lot feeding 12 lots of pigs, averaging approximately 43 lbs. in live weight, were fed for 110 days on rape pasture with various grain rations, while another lot was fed on alfalfa pasture, and four other lots were fed in dry lot.

Two of the lots fed on rape pasture received shelled corn self-fed and one lot received tankage also self-fed, while the other lot received 0.25 lb. of tankage hand-fed per pig daily. Both lots received a mineral mixture of salt, limestone, boneblack, and potassium iodide. The results showed that the pigs receiving the limited feeding of tankage made an average daily gain of 1.5 lbs., and required 340 lbs. of feed per 100 lbs. of gain, while those receiving tankage self-fed made an average daily gain of 1.68 lbs., and required 329 lbs. of feed per 100 lbs. of gain. When ground oats, whole oats, or dehulled oats were self-fed in addition to the corn the pigs made average daily gains of 1.60, 1.50, and 1.71 lbs., respectively, and required a total of 345, 346, and 346 lbs. of feed per 100 lbs. of gain. When dry ground oats, dry whole oats, soaked ground oats, or soaked whole oats were fed with tankage during the first 92 days of the experiment, after which corn was added to the ration, the pigs made average daily gains of 1.19, 1.30, 1.38, and 1.19 lbs., respectively, consuming 384, 384, 409, and 416 lbs. of feed per 100 lbs. of gain. When dehulled oats or oat residues were similarly fed the average daily gains were 1.62 and 1.04 lbs., and the feed consumption per 100 lbs. of gain was 364 and 495 lbs., respectively. When table scrap meal was self-fed for the first 60 days, followed by tankage for the rest of the experiment, corn being fed throughout, an average daily gain of 1.48 lbs. was made, and the total feed consumption per 100 lbs. gain was 328 lbs.

When corn and tankage were both self-fed with alfalfa pasture the pigs made an average daily gain of 1.73 lbs., and consumed a total of 329 lbs. of feed per 100 lbs. of gain.

Similar feeding of corn and tankage in dry lot produced an average daily gain of 1.57 lbs., and required 365 lbs. of feed per 100 lbs. of gain. Substituting the so-called Trinity mixture, tankage, linseed oil meal, and alfalfa meal 2:1:1 for the tankage used in the above lot or modified Trinity mixtures consisting of tankage, linseed oil meal, and alfalfa meal 6:3:1, and a one-third mixture, in which alfalfa leaf flour replaced the 10 parts of alfalfa meal, average daily gains of 1.71, 1.71, and 1.64 lbs. per head daily were made, the feed requirements per 100 lbs. of gain being 348, 358, and 345 lbs.

From these results it is concluded that the addition of oats, either ground or whole, at current prices increased the calculated profits when added to the full-fed ration of corn with limited amounts of tankage on rape pasture. Dehulled oats also increased the rate of gain but lowered the margin because of the enhanced cost. The oat residues, which were the by-products of dehulling, proved to be an inefficient feed. The feeding of the oats whole and dry appeared to be more economical than grinding or soaking. Alfalfa proved slightly superior to rape pasture for growing and fattening pigs, but the four lots fed in dry lot also did well and made creditable gains with satisfactory profits over feed costs. The mixture of tankage, linseed oil meal, and alfalfa meal proved slightly superior to tankage as the supplement to corn when fed in dry lot, but alfalfa leaf flour was apparently not much superior to straight alfalfa meal.

Corn gluten feed, enzymes, oat feed, minerals, and water supply for fattening spring pigs, C. C. Culbertson, J. M. Evvard, W. E. Hammond, and

C. F. Bassett (*Iowa Sta. Leaflet 18* (1926), pp. 10).—In these experiments 9 lots of 5 pigs each, averaging approximately 50 lbs. in live weight, were self-fed in dry lot during the summer to a weight of 225 lbs. Two check lots received shelled corn self-fed plus a supplemental protein mixture of tankage, linseed oil meal, and alfalfa meal 70 : 25 : 5, which was fed with a mineral mixture consisting of salt, limestone, boneblack, and potassium iodide. These 2 lots made average daily gains during the experiment of 1.61 and 1.68 lbs., respectively, requiring a total of 346 and 344 lbs. of feed per 100 lbs. of gain. Another lot was similarly fed, but instead of being watered in open troughs 2 or 3 times daily, the pigs in this lot had access to an automatic waterer. An average daily gain of 1.60 lbs. was made, and the feed requirement per 100 lbs. of gain was 356 lbs.

In other lots equal portions of the protein supplement were replaced by the following amounts of other supplements: 4 per cent of Protozyme, 12 per cent of Protozyme, 50 per cent of corn gluten feed, 25 per cent of ground oat feed, and 50 per cent of ground oat feed. The results showed that these lots made average daily gains of 1.71, 1.47, 1.63, 1.62, and 1.52 lbs., respectively, and required as feed per 100 lbs. of gain 338, 362, 355, 354, and 369 lbs. The mineral supplement of another lot was modified by the addition of 10 per cent of sodium bicarbonate, 4 per cent of venetian red, and 1 per cent of manganese sulfate. This lot made an average daily gain of 1.67 lbs. and required 359 lbs. of feed per pound of gain.

The comparative results in connection with the Protozyme showed that the addition of 4 per cent in the supplemental protein mixture apparently increased the gains slightly and decreased the feed required per unit of gain, but increased the cost of feed, consequently lowering the profit. When 12 per cent of this substance was included in the supplemental protein mixture the gains and feed consumption were reduced, and larger amounts of feed were required per unit of gain. The substitution of corn gluten for a portion of the supplemental protein mixture did not prove profitable. The addition of 25 per cent of oat feed in the supplemental protein mixture produced practically the same gains and showed practically the same margin over feed costs as the check lot. When 50 per cent of the oat feed was added, however, the gains were appreciably reduced, but the cost of gain was not materially affected. The additions to the mineral mixture proved beneficial, as the pigs made more rapid gains, but more feed was required per unit of gain and the cost was slightly increased. No advantage was evident from the use of the automatic waterer.

Protein supplements, mineral mixtures, outdoor sunshine, and water supply for fall pigs, J. M. Evvard, C. C. Culbertson, and W. E. Hammond (*Iowa Sta. Leaflet 17* (1926), pp. 19).—The results of experiments dealing with the effect of adding various supplements to rations of corn and tankage self-fed are reported. Three lots of pigs averaging approximately 56 lbs. per head were used, the data being calculated for a 120-day feeding period or until a weight of 225 lbs. was attained. All lots except one had the self-feeders placed in the houses.

Two of the lots were fed a basal ration, plus a mineral mixture of salt, ground limestone, boneblack, and potassium iodide and were considered as controls. These lots made average daily gains of 1.57 and 1.51 lbs., respectively, in the entire feeding period and required 110.5 and 109 days, respectively, to reach 225 lbs. live weight. They consumed a total of 433 and 427 lbs. of feed per 100 lbs. of gain. A third lot receiving the same feed except that the self-feeders were placed out-of-doors in the sunshine made an average daily gain of 1.64 lbs. and consumed 394 lbs. of feed per 100 lbs. of gain. A fourth lot receiving

the same feeds as the check lot except that water was supplied in an automati water heater made an average daily gain of 1.63 lbs., and consumed 388 lbs. o feed per 100 lbs. of gain. Additions of 0.5 and 5 per cent of radioactive mantl ash and tankage increased the rate of gain to 1.66 and 1.69 lbs. daily an reduced the amounts of feed required per 100 lbs. of gain to 413 and 384 lbs respectively, but because of the high price mantle ash was not an efficier supplement. The so-called Trinity mixture, consisting of tankage, linseed oi and alfalfa meal 2:1:1 produced an average daily gain of 1.56 lbs. and require 408 lbs. of feed per 100 lbs. gain, while modifications in the Trinity mixtur during the progress of the experiment by decreasing the alfalfa meal from 2 per cent to 5 per cent with a corresponding increase in the amount of tankage produced an average daily gain of 1.70 lbs., and required 390 lbs. of feed pe 100 lbs. of gain.

It is pointed out that alfalfa meal and linseed meal when combined wit tankage make a more efficient protein mixture than tankage alone. Th modification in the Trinity mixture also proved slightly more efficient tha the regular Trinity mixture and is suggested when the pigs are in good shap but when the pigs are not doing nicely it is not advisable to reduce the amoun of alfalfa meal.

The feeding of two types of table scrap meal in connection with the shelle corn and mineral rations produced an average daily gain of 1.54 lbs. each. Th amounts of feed required per 100 lbs. of gain were 409 and 418 lbs., respec tively. They thus increased the rate of gain over the check lot and lessene the feed requirement. In three of the lots the mineral mixture was modified in one case by the addition of 2 per cent manganese sulfate, in another by th addition of 10 per cent of sodium bicarbonate, and in a third by 5 per cent of venetian red. As compared with the check lots in the rate of gain and the feed required per unit of gain these additions proved beneficial. The calculated profits over feed costs were also relatively high in the three lots.

Protein supplements to corn in dry lot for fattening pigs, E. G. GODBEY and A. L. DURANT (*South Carolina Sta. Bul. 234 (1926), pp. 3–14, fig. 1*).—This bulletin reports the results of three experiments in which the efficiency of various protein supplements to corn was compared. All three experiments were similarly conducted with 6 lots of approximately 10 pigs, ranging in average weight from 62 to 75 lbs. per head. The supplements compared were tankage, fish meal, soy bean oil meal, peanut oil feed, soy bean oil meal and fish meal, and peanut oil feed and fish meal. The proportionate amount of supplement and corn fed was varied with the age of the pigs, but was similar in all three experiments.

The combined results showed that the pigs on corn and tankage made an average daily gain of 1.61 lbs. per head and required 369 lbs. of corn and 38 lbs. of tankage per 100 lbs. of gain to reach an approximate market weight of 200 lbs. With the supplement of fish meal the pigs made an average daily gain of 1.87 lbs. and required 323 lbs. of corn and 50 lbs. of fish meal per 100 lbs. of gain, reaching the required weight in 72 days. Gains of 1.46 lbs. per head daily were made by those pigs receiving soy bean oil meal, and the feed consumption per 100 lbs. of gain was 350 lbs. of corn, 59 lbs. of soy bean oil meal, and 91 days were required to attain market weight. With the peanut oil feed the average daily gain was 1.28 lbs., and 359 lbs. of corn and 103 lbs. of peanut oil feed were required per 100 lbs. of gain. With the combination of soy bean oil meal and fish meal the required weight was reached in 72 days, the pigs making an average daily gain of 1.88 lbs., and requiring 309 lbs. of corn and 24 lbs. each of soy bean oil meal and fish meal per 100 lbs. of

gain. The required market weight of 200 lbs. was also reached in 72 days by the pigs receiving the supplement of peanut oil feed and fish meal. The average daily gains made by the pigs on peanut oil feed and fish meal were 1.84 lbs. per pig, and the feed requirement was 314 lbs. of corn and 30 lbs. each of peanut oil feed and fish meal.

From these experiments it is concluded that fish meal is superior to tankage as a supplement to shelled corn for pigs fed in dry lot, but that vegetable protein alone is not as efficient as protein from animal sources. Soy bean oil meal produced more rapid and more economical gains than peanut oil feed (with hulls) as a supplement to corn. The combination of plant and animal proteins as supplements to corn proved more efficient than the animal proteins fed alone. Cases of stiffness and lameness were observed in the pigs receiving the corn and soy bean oil meal ration.

Wyoming corn for pork, W. L. Quayle (*Wyoming Sta. Bul. 148 (1926), pp. 16, figs. 4*).—This bulletin reports the results of three comparative feeding trials with Wyoming irrigated corn, Wyoming dry-land corn, and eastern Nebraska corn. In the first trial, which lasted 70 days, pigs averaging approximately 142 lbs. made average daily gains of 1.73, 1.70, and 2.00 lbs. on the respective types when self-fed with tankage and alfalfa. In the second trial 53-lb. pigs were fed for 100 days and made average daily gains of 1.53, 1.44, and 1.31 lbs., respectively, on the different types of corn. In the third trial 107-lb. pigs were fed for 84 days, making average daily gains of 2.01, 1.93, and 1.89 lbs., respectively.

In two of the three trials it required from 3 to 7 per cent more eastern Nebraska corn than Wyoming corn to produce 100 lbs. of gain. Due to the higher price of the eastern Nebraska corn gains were made at a relatively cheaper rate on the Wyoming corn. It is concluded from these hog-feeding trials that Wyoming corn is at least fully as efficient for pork production as corn from eastern Nebraska.

Chemical analyses of the three types showed that the differences in the moisture content of Wyoming corn and eastern Nebraska corn were practically negligible, notwithstanding the common belief which exists that Wyoming corn usually contains more moisture.

Fattening pigs with rye, G. W. Morgan and C. N. Arnett (*Montana Sta. Bul. 192 (1926), pp. 19, figs. 7*).—The results of 4 tests of winter fattening fall pigs and 3 tests of fall fattening spring pigs by self-feeding grain rations of barley or rye alone, or mixtures of these 2 grains in equal parts, or 3:1, or 1:3 are reported. Second or third cutting alfalfa hay was fed as a supplement in all the experiments, except that during the last 40 days of the first winter feeding trial the pigs received tankage. The fall pigs varied from 35 to nearly 60 lbs. in weight at the beginning of the different experiments. The average initial weights per pig in the 3 experiments with spring pigs were 122, 67.5, and 77 lbs. The feeding period was continued in all the experiments until the pigs averaged approximately 200 lbs. in live weight.

The combined results showed that the highest daily gains were made by fall pigs on the ration of 25 per cent of barley and 75 per cent of rye, and the smallest daily gains were made when barley or rye were fed alone. The spring pigs made the largest average daily gains on the mixture of equal parts of barley and rye. With one exception the feed required per unit of gain by both fall and spring pigs decreased as the proportion of rye in the grain mixture was increased.

It is pointed out that the pigs finished on the rations containing barley were in better condition and carried more fat than those finished on rye, but local butchers preferred the rye-finished animals because of the greater proportion of lean to fat in the carcass.

Fillies made good growth on soybean ration (*Illinois Sta. Rpt. 1925, p. 72, fig. 1*).—Draft fillies fed approximately 1 lb. of soy-bean hay, 1 lb. of sheaf oats, and 0.25 lb. of grain per 100 lbs. daily for 140 days gained at the rate of 1.45 lbs. per day in an experiment conducted by J. L. Edmonds and C. W. Crawford.

[Feeding and nutrition experiments with poultry at the Illinois Station] (*Illinois Sta. Rpt. 1925, pp. 77–83, figs. 3*).—The results of the following experiments are briefly reported:

Study composition of gains made by chickens.—In continuing the study by H. H. Mitchell, T. S. Hamilton, and L. E. Card of the changes in the composition of White Plymouth Rocks during growth (E. S. R., 55, p. 669), 10 fertile eggs were dissected and analyzed on each day of incubation from the fourth to the twenty-first days as well as fresh eggs and chicks of from 1 to 3 days of age. The results showed that the dried weight of the embryo increased rapidly at about the twelfth day of incubation, reaching a maximum on the sixteenth day, and was followed by a retardation in the rate of growth on the seventeenth day. During incubation the weight of the eggs decreased 11 gm., the weight of the dry substance about 3.5 gm., and the energy value about 28 calories. A distinct transfer of calcium from the shell to the embryo was indicated.

Study vitamin deficiencies in poultry rations.—In vitamin studies by Mitchell and Card, 12 lots of 15 chickens each were fed on a basal ration of white corn, tankage, yeast, cottonseed oil, and salt, which was presumably low in the fat-soluble vitamins. Three of the lots received no other supplements, three received heated and aerated cod-liver oil in place of the cottonseed oil (supplying D but not A), three received 5 per cent of spinach (supplying A but little D), and three lots received untreated cod-liver oil (supplying A and D). Four of the lots, one receiving each type of ration, were kept in a darkened room. Four similar lots were also kept in a darkened room but received 15 minutes' exposure to ultra-violet light, and the other four lots were kept at the poultry plant and allowed direct exposure to the sunlight. Those birds receiving the rations deficient in vitamin A or vitamins A and D died off rapidly, but those having access to sunlight lived longer and reached heavier weights. Mortality was low in the other six lots, but the birds having access to direct sunlight were in better condition at the conclusion of the experiment, as many from the other lots had deformed legs and feet, weak legs, and rough feathers.

It is concluded that the limiting deficiency in the basal ration was a lack of vitamin A, and that the environment of the chickens kept at the poultry plant was more favorable for normal growth and development than were the conditions of the other lots kept at the laboratory. Deaths from the vitamin A deficiency resulted in most cases before ophthalmia developed.

Energy values of farm chicken feeds studied.—In the course of the determination of the net energy values of common farm feeds for chickens it was found by Mitchell that from 82 to 85 per cent of the gross energy of corn and wheat was metabolizable, though the heating effect of these foods on chickens seemed to be extremely variable and efforts were made to find the conditions responsible for the wide degree of variation.

Heat produced in fasting chickens was found to increase for all temperatures lower than 55 to 70° F., different chickens showing different temperatures at which heat production was increased.

Annual persistency in relation to winter and annual egg production, F. A. Hays and R. Sanborn (*Massachusetts Sta. Tech. Bul. 9 (1926), pp. 189–203, fig. 1*).—In continuing this series (E. S. R., 55, p. 672), the correlation

between the number of days that the birds in the Rhode Island Red flock laid before the complete onset of molt and the following conditions related to production were as follows: The date that hatching commenced, −0.2208±0.0137; age at first egg, −0.6146±0.0090; weight at first egg, −0.3225±0.0131; net winter rate, +0.1835±0.0141; length of winter pause, +0.1017±0.0182; total days broody, +0.0532±0.0209; winter production, +0.4551±0.0115; and annual production, +0.7082±0.0072. The variability of the birds for the various characters used is indicated in each case as well as the regression coefficients, and the correlation coefficients are further calculated for each on the basis of the proportion of the population above or below the mean for each character.

From the analysis of the data it is concluded that persistency is positively correlated to a greater or a less extent with early hatching, winter rate of laying, length of winter pause, winter production, and annual production, and is negatively correlated with the age at first egg, weight at first egg, and presence of broodiness.

The litter problem, D. C. KENNARD and L. B. NETTLETON (*Ohio Sta. Bimo. Bul., 11 (1926), No. 6, pp. 229–231*).—Essentially a discussion of the use of straw, shavings, peat, and slag as litter for poultry houses, based on the results of tests at the station.

Poultry keeping in back yards, M. A. JULL and A. R. LEE (*U. S. Dept. Agr., Farmers' Bul. 1508 (1926), pp. II+29, figs. 26*).—A revision of Farmers' Bulletin 1331 (E. S. R., 49, p. 777).

DAIRY FARMING—DAIRYING

[Feeding experiments with dairy cattle at the Illinois Station] (*Illinois Sta. Rpt. 1925, pp. 90–92, figs. 2*).—The results of three experiments conducted by W. B. Nevens are briefly reported.

Thickly planted soy beans make best quality hay.—Hay from soy beans planted thickly was found to have less coarse stems, and smaller amounts of hay were refused than when the soy beans were not so thickly planted.

Legume hays fill lime needs of dairy cows.—Mineral supplements to rations including legume hays at the rate of 3 to 4 per cent of the concentrate mixture were found to be too laxative, and 1 to 2 per cent of mineral supplements appeared to be adequate. Mineral supplements to rations containing timothy hay and corn silage were ineffective in preventing a more rapid decline in milk production than occurred when alfalfa hay was fed. There appears to be no craving for lime by dairy cattle when receiving rations of legume hays and corn silage as roughage.

Silages from immature corn had low feeding value.—The large southern varieties of late maturing corn, containing about 22 per cent of dry matter, produced silage of good keeping qualities but of low feeding value and palatability. An early maturing prolific type of corn gave as large yields in dry matter as the southern varieties. Acid determinations showed small differences in the silage from early and late maturing types, though an immature southern corn produced silage of very low palatability for sheep. This silage had a sharp and slightly bitter taste.

Feeding dairy animals, L. S. CORBETT (*Maine Agr. Col. Ext. Bul. 164 (1926), pp. 43*).—The principles of feeding are briefly presented with special reference to dairy animals, together with the chief requirements of the feeding stuffs law, definitions of feeds, and other related information.

Liberality and economy in feeding dairy cows, A. E. PERKINS (*Ohio Sta. Bimo. Bul., 11 (1926), No. 6, pp. 210–216, figs. 4*).—A discussion of the economy

of liberal feeding for milk production based on data previously noted in Bulletin 334 (E. S. R., 41, p. 274). It is pointed out that high-producing cows should be fed liberally, but not all cows have sufficient capacity to utilize large amounts of feed economically.

Experimental disturbances in the milk secretion of the cow, F. A. DAVIDSON (*Jour. Agr. Research [U. S.], 33 (1926), No. 9, pp. 873-885, figs. 5*).—As was reported in a previous paper (E. S. R., 52, p. 175), returning 300 cc. of milk into one quarter of a cow's udder after milking dry at the Illinois Experiment Station markedly decreased the lactose content and amount of the milk produced and increased the fat, protein, and ash contents of the milk from that quarter in the first 2 or 3 subsequent milkings.

Injections of 300 cc. of an isotonic salt solution of sodium and potassium chlorides and sodium and potassium citrates or an isotonic lactose solution had similar effects, but injections of 300 cc. of distilled water showed no regular effects. Leaving one-half of the milk in the udder appeared to affect only the fat content, thus differing from the influence of the injections of the milk or of the salt or lactose solutions.

In discussing the results it is suggested, with reference to milk secretion, that during milking the secretory cells are gradually giving off their products which are drawn away. This process lowers the concentration within the secretory cells to a point below that of the milk itself, so that when milk is injected there tends to be an absorption of the soluble materials by the cells which would affect the composition of the milk subsequently secreted. With milk left in the udder the concentration of solvents was not reduced within the secretory cells, absorption was limited, and the composition of the subsequent milk was not so greatly changed.

Official records as material for studying inheritance of milk and butterfat production, M. H. FOHRMAN (*Jour. Dairy Sci., 9 (1926), No. 3, pp. 286-292*).—The coefficients of correlation between the initial and reentry butterfat records of 19 age groups of Guernsey cows and 33 age groups of Jersey cows and the initial and reentry milk records of 16 age groups of Ayrshire cows are given as determined from studies in the U. S. D. A. Bureau of Dairying.

The correlation coefficients for the Guernseys varied from 0.8591 to 0.3290 and averaged 0.6605, for the Jerseys from 0.8116 to 0.3391, averaging 0.6071, and for the Ayrshires from 0.6445 to 0.0826, averaging 0.5021. The mean standard deviation and the coefficient of variation are given for each age group. There was found to be a greater variability among the reentry records than in the initial records. With increases in the length of time between the initial and reentry records there was some tendency for the correlations to be lowered. Environmental influences are assumed to be the cause for the correlation coefficients not being 1 in the different groups.

Good bulls and good foundation cows the source of better dairy cattle, L. H. FAIRCHILD (*Indiana Sta. Bul. 299 (1926), pp. 20, figs. 12*).—data are presented showing the influence which the Jersey and Holstein bulls in the station herd have had in improving the average production of their daughters as compared with the daughters' dams. The average milk and fat production of the several generations which have descended from the foundation cows of each of these herds are also given.

[Experiments in dairying at the Illinois Station] (*Illinois Sta. Rpt. 1925, pp. 97-102*).—The results of the following experiments are briefly reported:

Some causes found for poor pasteurization.—A continuation of the study of pasteurization by M. J. Prucha (E. S. R., 54, p. 374) has shown that the reasons for inefficient pasteurization under commercial conditions as compared with

laboratory conditions include the difficulty of heating every drop of milk to the proper temperature and for the full length of time. Leaky valves of the pasteurizing vat, foam on the milk, recording thermometers not registering correctly, and valves in the outlet pipe not set sufficiently close to the vat were found to be some of the reasons for this condition.

Limes seem best neutralizers of cream acidity.—In studies by B. A. Stiritz and H. A. Ruehe of various neutralizers for acidity of cream used for the manufacture of butter it was found that a better quality of fresh butter and a more thorough churning were secured with a 5 per cent solution of soda ash or sodium bicarbonate and a 10 per cent solution of lime than with a stronger solution of these neutralizers. Soluble neutralizers reacted completely in 2 minutes, while the calcium limes required 5 minutes, and the magnesium limes 10 to 15 minutes. The amount of reduction of the acidity during pasteurization seemed to depend upon the solubility of the neutralizer and upon the formation of carbon dioxide gas which was driven off by heat. Soda ash increased the amount of the fat lost in the buttermilk, while sodium bicarbonate and the limes gave a more exhaustive churning. None of the neutralizers used improved the quality of the fresh butter, but when used separately they gave higher scores than when two were used together. When soda ash was used in the neutralizer, either by itself or with lime, the butter was of a higher quality at the start, but did not hold up as well in storage as butter in which sodium bicarbonate was used as a neutralizer, and rancidity frequently developed in storage from butter in which soda ash had been used for neutralizing the cream.

Butterfat loss from incomplete churning reduced.—Studies of the possibilities of reducing the amount of fat lost in the buttermilk by Ruehe and Stiritz showed that the addition of 1 per cent of salt to the cream before churning was effective, a small amount, 0.2 to 0.3 per cent, of which was incorporated in the butter. The addition of hydrochloric acid to the cream before churning was more effective than sodium chloride and did not appear to increase the total acidity of the butter. A combination of the two products was more effective than when either was used alone. It was not possible to reduce the fat content of buttermilk from neutralized cream below an average of approximately 0.5 per cent. The use of disodium phosphate, sodium citrate, or thorium nitrate proved ineffective in decreasing the fat content of buttermilk, and oleic acid, because of its deteriorating effect on the quality of the butter, was unsatisfactory.

Butter quality depends upon that of cream.—These investigations conducted by Prucha and J. M. Brannon have indicated that the keeping quality of butter is largely dependent upon the quality of the cream from which the butter is made, due to the relation of bacteria to the development of flavors in butter.

Previous tests on ice cream quality confirmed.—In studies by A. S. Ambrose and P. H. Tracy of the effect of various ingredients on the quality of the ice cream produced, it was found that those ice creams having a low acid content had a smoother texture and a greater resistance than those with a high acid content. The best flavor was obtained when the acidity ranged from 0.1 to 0.2 per cent. The addition of dehydrated egg yolks produced a smoother texture and greater resistance, but the flavor was objectionable to many, and a similar texture and resistance could be obtained by the addition of milk solids. The source of milk solids was proven of considerable importance. Homogenization of the ice cream mix produced a more desirable product, having somewhat the same effect as the use of additional milk solids. A low overrun usually gave a smoother texture and increased resistance. When the ice cream was drawn

from the freezer in a very soft condition it tended to become coarse in texture on thickening.

Best methods determined for counting bacteria.—Studies by Prucha of the methods of making determinations of the bacterial content of milk for different purposes indicated that the reductase test was probably best suited for grading raw milk as received at the milk plant from farmers. The direct-count method may also be used for this purpose, but for commercial plant control and for the examination of milk as delivered to the consumer the plate method appeared to be best suited.

[*The preparation of Lactobacillus acidophilus milk*].—In attempts by Prucha to prepare acidophilus milk under commercial conditions the best results were obtained by inoculating the milk with a pure culture of *L. acidophilus* in from 3 to 6 per cent concentration, incubating at 100° F. until the acidity reached from 0.6 to 0.7 per cent acid, cooling to 40 or 50° to arrest bacterial growth, and shaking with 1 per cent of fat. It is stated that the milk when thus prepared and stored at a temperature of 40° or lower can be kept 2 or 3 days without wheying off or deteriorating in flavor.

The number of cells in cream, skim milk, and separator and centrifuge slimes, R. S. Breed (*New York State Sta. Circ. 88 (1926), pp. 7*).—Determinations of the cell contents of cream and of different portions of the milk when separated by gravity, by separators, and by centrifuging showed that gravity-raised cream contained large numbers of cells. Cream caused to rise by slow speed centrifuging contained somewhat smaller numbers of the cells in the milk, but cream obtained by separators was practically free from cells. The skim milk produced by any of the methods contained few cells, as they either rose with the cream or were precipitated in the separator slimes.

The centrifuge slimes obtained in Stewart-Slack tubes were variable as to the relative amounts of the total cells in the milk which they contained. Trommsdorff tubes were efficieut for measuring the amount of slime, but as no definite relation between the cell content and the amount of slime was established they were inefficient for determining the numbers of cells present.

Cream separators operated under normal conditions precipitated practically all of the cells present in the milk.

Produce clean milk, C. N. Shepardson (*Colo. Agr. Col. Ext. [Bul.] 245-A (1925), pp. 12, figs. 9*).—A brief popular account of the more important factors influencing the production of clean milk.

Practical dairy tests, A. D. Burke (*Milwaukee: Olsen Pub. Co., 1926, pp. 219+[3], fig. 1*).—This book gives outlines for conducting various chemical tests of milk and dairy products.

Some factors influencing the keeping quality of butter, D. J. Retief (*Union So. Africa Dept. Agr., Sci. Bul. 43 (1926), pp. 22, figs. 3*).—This deals with the effect of bacterial contamination, acidity, and other factors on the keeping quality of butter, including data from various experiments related to the improvement of the quality of butter through pasteurization and neutralization of the cream.

Peroxidase as a factor in butter deterioration, L. S. Palmer and M. M. Miller (*Jour. Dairy Sci., 9 (1926), No. 3, pp. 272–275*).—The results of an experiment at the Minnesota Experiment Station are presented in which a peroxidase solution concentrated from horse-radish roots was added to both sweet and ripened pasteurized cream. The butter made from the samples containing peroxidase showed no differences in composition as compared with check samples even after storage for 11 months at room temperature or at 0° C. Tests for peroxidase throughout the storage period were positive for the samples

to which this substance had been added. These results indicated that peroxidase is not a direct cause of butter deterioration. Pasteurization enhances the keeping quality of butter by the elimination of agents causing deterioration other than peroxidase.

Microscopy of cheese [trans. title], O. LAXA (*Sborn. Československ. Akad. Zeměděl. (Ann. Czechoslovak Acad. Agr.), 1 (1926), No. 1, pp. 47–65, figs. 32; Fr. abs., p. 65*).—The microscopic appearance of various types of cheese is described and illustrated. It was found that the structure of cheese depends upon the quality of the milk used, the kind of coagulation, and the method of manufacturing and ripening.

Cottage cheese, P. S. LUCAS (*Michigan Sta. Circ. 97 (1926), pp. 10, figs. 3*).—General directions for the manufacture of cottage cheese and various modified types are given.

VETERINARY MEDICINE

A text-book of pathology, F. DELAFIELD and T. M. PRUDDEN, rev. by F. C. WOOD (*New York: William Wood & Co., 1925, 13. ed., rev., pp. VI+1354, pls. 18, figs. 810*).—This is another revised edition of the work previously noted (E. S. R., 50, p. 180).

Chemical pathology, H. G. WELLS (*Philadelphia and London: W. B. Saunders Co., 1925, 5. ed., rev., pp. 790*).—This is a revised and reset edition of the work previously noted (E. S. R., 45, p. 381).

The National Formulary (*[Baltimore]: Amer. Pharm. Assoc., 1926, 5. ed., pp. XLI+545*).—This fifth edition (E. S. R., 36, p. 378), prepared by the Committee on National Formulary of the American Pharmaceutical Association, is official from July 1, 1926.

The dispensatory of the United States of America, H. C. WOOD, C. H. LAWALL, H. W. YOUNGKEN, J. F. ANDERSON, and I. GRIFFITH (*Philadelphia and London: J. B. Lippincott Co., 1926, 21. ed., rev., pp. XXX+1792*).—This thoroughly revised and partly rewritten edition (E. S. R., 39, p. 884) is based upon the tenth revision of the United States Pharmacopoeia (E. S. R., 55, p. 473), the National Formulary above noted, and the British Pharmacopoeia. Following an explanatory introduction, a list of abbreviations, and the texts of the Food and Drugs Act and the Harrison Narcotic Act, the three parts of this work deal with (1) drugs recognized by the United States Pharmacopoeia, the Pharmacopoeia of Great Britain, or the National Formulary (pp. 1–1179), (2) unofficial drugs (pp. 1181–1531), and (3) matters included in the General Tests, Processes, and Apparatus of the U. S. Pharmacopoeia and the Appendix of the British Pharmacopoeia which are not given elsewhere in the volume, together with a collection of formulas for reagents used in the examination of urine, blood, etc., which is an amplification of the Diagnostical Agents and Clinical Tests of the U. S. IX (pp. 1533–1649), and preparations of the National Formulary (pp. 1650–1689).

[Livestock disease investigations] (*Illinois Sta. Rpt. 1925, pp. 61–68, 76, 77, 84–88, figs. 5*).—In studies by R. Graham, E. A. Tunnicliff, and E. R. Frank of avian tuberculosis in market pigs, the glands of 163 tuberculous swine originating in 27 counties, detected among 6,041 hogs in 85 carloads, were investigated. Of the 62 animals the glands of which were typed in guinea pigs and chickens, 82.2 per cent were avian, 11.2 per cent avian and mammalian, and 6.4 per cent mammalian. The accuracy of the laboratory tests, checked by inspection of the farms from which the tuberculous hogs had been shipped, suggest the probability that avian tuberculosis in swine is being perpetuated in these animals independently of continuous direct exposure to infected fowls, and

further that the avian infection may be found to be transmitted from pig to pig.

A brief reference is made to further studies of inheritance of resistance in the offspring of hogs naturally resistant to hog cholera (E. S. R., 54, p. 377). The progress of immunization work with suckling pigs, conducted under practical farm conditions by Graham and Tunnicliff, is summarized. Only a small percentage of pigs given serum and virus while sucking succumbed to cholera several months later when they were exposed to the disease, but definite conclusions regarding the practicability of immunizing suckling pigs can not be drawn until further work has been carried out. Experiments started during the year by Graham and Tunnicliff in cooperation with W. E. Carroll show that pigs in lots free from roundworm infestation gained faster and appeared thriftier than hogs on infested lots. A comparison is being made of pigs kept on clean pastures with others raised on pastures infested with swine parasites.

Bacteriological examinations made of the nongravid uteri and ovaries of sows infected with *Bacterium abortum* (Bang) by Graham and Tunnicliff suggest that naturally infected females may harbor the virus of the disease in the reproductive organs for an indefinite period, thus differing from cattle, in which the virus is eliminated from the uterus of the aborting cow in from 6 to 8 weeks following abortion. Pigs fed virulent cultures of *B. abortum* were found to be harboring the organism in the testicles several weeks later at the time of castration. It is pointed out that febrile diseases appear to be responsible for some cases of abortion in swine.

In immunity studies of hemorrhagic septicemia by Graham, Tunnicliff, and Frank, it was found that rabbits and guinea pigs injected with the artificial aggressin resist artificial infection more consistently than following bacterin injection. The resistance produced by artificial aggressin, however, is neither dependable nor consistent measured by laboratory methods. Attempts by these authors to develop an experimental antitoxin for the prevention and treatment of *Clostridium botulinum* type C food poisoning were commenced.

A comparison made by Frank, W. G. Kammlade, and A. K. Mackey of carbon tetrachloride with copper sulfate treatment in removing stomach worms from sheep showed the former to be the more efficient. The dose consisted of a No. 11 capsule containing 5 cc. of the carbon tetrachloride and as much dry magnesium sulfate as it would hold.

In work by Graham, Tunnicliff, and Frank (E. S. R., 54, p. 380) during the year 54,519 fowls in 407 flocks from 64 counties were given the agglutination test and 11.71 per cent found infected with bacillary white diarrhea. In connection with the routine application of the agglutination test, a comparison was made of the accuracy of 1 to 10, 1 to 50, and 1 to 100 dilutions, and the results indicate that the 1 to 10 detects the highest percentage of reactors, or 4 per cent more than the 1 to 50 dilution and approximately 9 per cent more than the 1 to 100 dilution. This comparison of the different dilutions led to the adoption by the station of a 1-tube test using the 1 to 10 dilution. A comparison was made during the past two years of the agglutination test with the intradermic test with more than 5,000 blood samples. Pullorin was injected intradermally into the wattles of fowls tested, and, while definite information was not obtained, the results have not eliminated pullorin as a diagnostic agent for the disease.

A brief reference is made to further work by Roberts and Card on the breeding of chickens in an effort to establish strains resistant to bacillary white diarrhea (E. S. R., 54, p. 380). Though definite conclusions can not yet be drawn, 53 out of 335 day-old chicks were found resistant to the disease.

Studies by Roberts and G. A. Lindsey of the effect of Fowler's solution upon animals indicate that those receiving the solution are more susceptible to disease than untreated animals.

[Work of the veterinary division], W. G. FREEMAN (*Trinidad and Tobago Dept. Agr. Rpt. 1925, pp. 27–30*).—An account of the occurrence of and control work with infectious diseases of livestock.

Report of proceedings in Northern Ireland under the Diseases of Animals Acts with returns of the exports and imports of animals for the year 1924, F. W. EMERY (*North. Ireland Home Off., Rpt. Proc. Diseases Anim. Acts [etc.], 1924, pp. 24*).—This is a report of the chief veterinary officer for the year 1924, with appendixes including statistical data on diseases among animals in Northern Ireland, exports and imports of animals, etc.

Report of the veterinary officer for the year 1924, C. R. TURBET (*Fiji Dept. Agr. Ann. Rpt. 1924, pp. 8–12*).—This report includes a discussion of the diseases of livestock in Fiji and control work conducted.

Animal diseases regulations with notes on diagnoses, F. E. LIONNET (*Mauritius Dept. Agr., Gen. Ser. Bul. 34 (1926), Eng. ed., pp. 24*).—This bulletin, which replaces one previously noted (E. S. R., 37, p. 780), presents the text of the revised ordinance and of the new rules made thereunder.

Does the flesh of animals suspected to be infected by foot-and-mouth disease form a source of danger for the spreading of virus? L. F. D. E. LOURENS (*Vet. Rec., 6 (1926), No. 45, pp. 995–998*).—The experiments here reported by the director of the Netherlands State Serum Institute at Rotterdam, three of which are described in detail, show that the virus of foot-and-mouth disease is particularly sensitive to the acids formed during the process of the ripening of the flesh. The work is considered by the author to indicate that there is no danger of the spread of foot-and-mouth disease in the flesh of animals slaughtered in the incubation period of the disease, nor even in that of animals killed in the eruptive stage of the disease. It was not possible to infect other animals with the flesh of sick animals 48 hours after the latter had been killed. The virus of foot-and-mouth disease died within 24 hours in vitro when mixed with meat juice.

Reference is made to investigations made by Schlögel in the State laboratory at Rheims concerning the prevalence, the resistance, and the destruction of the virus of foot-and-mouth disease in the skeletal muscles of diseased guinea pigs. In these experiments Schlögel used the flesh of 9 diseased guinea pigs, which were infected by virus from the seven-hundredth guinea pig generation. All check guinea pigs injected with the serum of the killed animals got the disease after 24 hours. The experiments are considered to prove that the virus can be present in flesh from diseased guinea pigs, but, by formation of acid, the virus is killed in every case within 18 hours. An editorial discussion of this work follows (p. 999).

A case of typhus-like fever following tick bite, R. R. SPENCER (*Pub. Health Rpts. [U. S.], 41 (1926), No. 45, pp. 2523, 2524*).—The author reports upon a case at Norfolk, Va., of typhus-like fever following a tick bite, the clinical aspects of which, in nearly every detail, suggested typhus fever, although it was not supported by the laboratory findings. Failure of the serum to agglutinate *Bacillus proteus* X_{19} and the negative results of animal inoculation do not, however, exclude typhus fever. The patient had been bitten in several places by a tick which came from a calf hide shipped from North Carolina or Virginia, and similar ticks were secured and proved to be *Amblyomma americanum*.

On the toxic action of sarcosporidiotoxin and its serological study [trans. title], S. SATO (*Jour. Japan. Soc. Vet. Sci., 5 (1926), No. 1, pp. 25–37;*

Eng. abs., pp. 32–37).—This contribution from the department of pathology and bacteriology of the Keio Medical College deals with the materials and method of extraction of the toxin, the properties of the sarcosporidiotoxin, toxic action of the toxic principle, and an immunological study with the toxin. It was found that rabbits may be highly immunized by repeated injections of the toxin.

Tumors of domestic animals, R. J. FORMAD (*U. S. Dept. Agr. Bul. 1449 (1926), pp. 40*).—In this account the author deals first with the etiology of tumors, including the constitutional dyscrasia or diathesis theory, the mechanical or irritation theory, the "embryonal rests" or preformation theory, the theory of nervous influence, and the parasitic theory. This is followed by a discussion of the classification of neoplasms (1) by nature, (2) by structure, and (3) by shape. Nomenclature is next briefly considered, followed by an extended discussion of the various tumors.

A promising treatment for infectious abortion, F. R. EDWARDS and J. H. COFFMAN (*Georgia Sta. Press Bul. 252 (1926), pp. 2; also in Jersey Bul. and Dairy World, 45 (1926), No. 46, pp. 1971, 2002; North Amer. Vet., 7 (1926), No. 12, pp. 31, 32*).—This is a progress report on work at the Georgia Experiment Station with acriflavine (diamino-methyl-acridinium chloride hydrochloride). The cows used in the experiment had all aborted on one or more occasions and had all given positive reactions to the agglutination test in dilutions ranging from 1 to 50 to 1 to 500 and higher. Three successive intravenous injections of the acriflavine in physiological saline solution, in dilutions of 1 to 500, 1 to 350, and 1 to 200, respectively, were given one week apart. The cows were divided into three groups of two each, and those in the first group received 100 cc., the second 150 cc., and the third 200 cc. of the solution at each injection. Three tests of the presence of the disease in the experimental cows were employed, (1) the agglutination test of the blood sera of the cows, (2) the intraperitoneal injection of milk from the cows into guinea pigs, and (3) the calving records of the cows. It was found that within one year after the work was started the reaction of the blood from one of the cows gradually became less markedly positive, and in 14 months it was negative to the test. The blood from all other cows was gradually losing its power to agglutinate the organism.

"The calving record is perhaps the most important of all from a practical standpoint. All cows receiving the two larger doses have bred and produced normal calves following a normal gestation period. Two of these cows had previously become nonbreeders from the disease. The two cows in the group receiving 100 cc. of the solution were nonbreeders and did not breed following the treatment. This would seem to indicate that large doses of the chemical are necessary. The use of acriflavine had no apparent bad effect on the cows except to reduce the flow of milk for a few days. Swellings were produced along the jugular groove and persisted for some time. This swelling was probably due to a needle of too large caliber being used for the first injection, allowing a slight leakage at the point of puncture in the vein. These swellings appeared within a few hours after the injection of the acriflavine, and, while they remained for some time, they did not seem to cause any physical reaction of the animal."

The problem of an obscure hemorrhagic disease in cattle, E. RECORDS and L. R. VAWTER (*Nevada Sta. Rpt. 1925, pp. 19, 20*).—This is a brief account of the work which led to the discovery that a new organism, described as *Clostridium hemolyticus bovis*, is the cause of this disease of cattle in Nevada. It has also been found possible to isolate the causative organism from the blood stream of clinical cases of the disease during life in some instances. During

the year the preparation and use of a lesion fluid substance similar to blackleg aggressin as an immunizing agent was thoroughly tried out but was found to be of no value. Preliminary tests of culture filtrates for the same purpose, however, yielded very promising results, and it is thought that a reliable immunizing agent will be available for field use within a year. It is stated that the serum for the treatment of natural cases of the disease has now reached a high state of efficiency, recovery running about 75 per cent as against about 100 per cent of deaths in cases not receiving the serum. An account of the work, by Vawter and Records, has been noted (E. S. R., 54, p. 677).

The etiology of tuberculosis in relation to satisfactory immunization in cattle, J. J. THOMSON (*Ann. Pickett-Thomson Research Lab., 2 (1926), No. 3, pp. 31–49*).—The author finds that if treatment is given over two generations immunization is possible in all cases, with the exception of offspring of cows in ill health. His work indicates a partial immunization of the dam and an immunization of the sire so that he will pass all tests for a long period. He considers immunization quite feasible in one generation, but less successful practically because calves from stock which is not immunized require far more feeding and care than those bred from cows and bulls rendered resistant to the disease.

The chemotherapy of surra of horses and cattle in India, J. T. EDWARDS (*Jour. Compar. Path. and Ther., 39 (1926), Nos. 2, pp. 83–112, figs. 2; 3, pp. 169–201, fig. 1*).—In this progress report it was found that outbreaks of surra, which occasionally occur in India, with high mortality, particularly among buffaloes, are easily checked by intravenous injections of relatively simple trypanocidal agents, such as tartar emetic or bismuth phosphate. Single injections usually suffice. A suitable therapeutic dose of tartar emetic is 5 cc. of an M/10 3.2 per cent solution per 100 lbs. body weight. The treatment does not destroy the whole of the trypanosomes in the animal's system, some persisting thereafter in a latent state of activity, apparently indefinitely. The results obtained after treatment with tryparsamide do not appear to be appreciably superior.

In equines it was found that the results obtained by the application of Bayer 205 surpass those obtainable by other medicaments. A suitable therapeutic dose for intravenous administration is 5 gm. in 10 per cent aqueous solution per 1,000 lbs. body weight. Tartar emetic comes next in value to, though far behind, Bayer 205. Bismuth compounds would appear to have much the same (though somewhat less intense and much less efficacious) action as the chemically related antimony preparations, studied in the form of tartar emetic. Tryparsamide proved disappointing in the results obtained.

A list is given of references to the general literature on Bayer 205, tartar emetic, tryparsamide, and bismuth compounds.

Training the dog, A. G. BLAIR (*Danville, Ind.: Danville Pub. Co., 1926, pp. 118, pls. 12*).—This is a practical account.

Experimental researches on the variolous, diphtheric affection of fowls, J. VERGE (*Recherches Expérimentales sur l'Affection Diphtero-Variolique des Oiseaux. Toulouse: J. Bonnet, 1926, pp. 230; rev. in North Amer. Vet., 7 (1926), No. 8, p. 64*).—This monographic account includes a complete chronological review of investigations of the disease since 1868.

Studies of fowl pest, I [trans. title], W. PFENNINGER and E. METZGER (*Schweiz. Arch. Tierheilk., 68 (1926), No. 1, pp. 2–21*).—This first contribution deals with the natural and the experimental infection.

Studies of fowl pest, II [trans. title], W. PFENNINGER and Z. FINIK (*Centbl. Bakt.* [etc.], *1. Abt., Orig., 99 (1926), No. 1–3, pp. 145–153, figs. 2*).—This second paper on the subject above noted is a contribution to the knowledge of the

histological changes in the central nervous system, based upon studies of the brain of 8 spontaneous and 17 experimentally infected fowls.

A coryne-bacillus as a cause of abscess in the feet of hens, Y. KAWAMURA (*Jour. Japan. Soc. Vet. Sci., 5 (1926), No. 1, pp. 21–24; Jap. abs., pp. 23, 24*).—Cases of this affection of fowls, due to *Staphylococcus pyogenes aureus*, were first reported by Kaupp in 1921 (E. S. R., 45, p. 888). Investigations at the veterinary laboratory of the Ministry of Agriculture and Forestry at Nishigahara, Tokyo, led to the isolation of a coryne bacillus and the production of necrosis by inoculation of pure cultures into the soft structure of chicken soles.

AGRICULTURAL ENGINEERING

[Agricultural engineering studies at the Illinois Station] (*Illinois Sta. Rpt. 1925, pp. 129–143, figs. 2*).—The progress results of a number of studies on different features of agricultural engineering are briefly summarized.

In work on tandem hitches, A. L. Young has found that short levers should be avoided, especially when used to distribute the pull between the front and rear horses, and that in working out 4–3 and 4–4 teams on 3-bottom plows such side draft as must be taken by the team should, for the most part, be placed on the lead horses. Supporting the front evener and the lead rod when turning at the end has not been found so important a factor as it might appear. It is considered doubtful that on the average farm a team should be strung out more than the length of two horses. The pulley has been found to have some advantages as an evener between the front and rear horses.

The work on the drying of soft corn by W. L. Burlison, E. W. Lehmann, and R. C. Kelleher has indicated that in general drying with forced unheated air is a slow and costly process when the temperature is low and the humidity is high.

Data are also reported on the use of electricity in agriculture, the development of electric water systems, 2-chamber septic tanks, plow draft under different conditions, the development of terracing practices, machines used in soy bean growing, and thresher adjustments.

Effect of the size of soil columns on the capillary rise of water, H. A. WADSWORTH (*Agr. Engin., 7 (1926), No. 6, p. 209, fig. 1*).—Studies conducted at the California Experiment Station upon the rate of capillary rise of water through soil masses of varying cross section are briefly reported.

The results indicate that within certain limits the capillary rise which may be expected through soil masses becomes greater as the cross section becomes greater. This was true for sizes up to 25 sq. in. in cross section. Beyond this limiting size, an increase in area did not result in a significant increase in rate of rise.

Intensive soil samples taken from carefully selected points within the soil mass indicated that points in the same horizontal plane carry about the same moisture content. There was no indication of a concentration of moisture within the center of the cross section nor in the zone lying in immediate contact with the walls of the column.

Centrifugal pump tests, H. E. MURDOCK (*Montana Sta. Bul. 190 (1926), pp. 22, figs. 15*).—Data from tests of a number of horizontal and vertical centrifugal pumps are reported and discussed and the test methods described.

Water works practice (*Baltimore: Williams & Wilkins Co., 1925, pp. XX+790, figs. 50*).—This is a manual of information on water works practice, issued by the American Water Works Association. It contains sections on collection of water, quality of water supply, treatment of water, distribution of water,

financing and management, and fire protection, together with an introduction and appendix.

Action of sodium and magnesium sulfates on Portland cement, G. R. SHELTON (*Indus. and Engin. Chem., 18 (1926), No. 8, pp. 854–856, figs. 2*).—Studies conducted at the University of Saskatchewan on the effect of sodium and magnesium sulfate solutions on commercial and white Portland cements to determine the action on Portland cement clinker and on its compounds taken separately are reported.

The white Portland cement was made by heating to a high temperature an intimate mixture of powdered marble, alumina, and flint in the proper proportions contained tricalcium aluminate, tricalcium silicate, and β-dicalcium silicate. Its reactions differed from those of commercial cement when both were similarly treated with solutions of sodium and magnesium sulfates, one difference being in the appearance of gypsum in the tests with crystalline commercial cement. The reaction products of white cement with sulfates were more like those of the pure cement constituents than were the products formed in the case of commercial cement.

The difference in character of the hydrated cements was very apparent, fine sulfoaluminate needles being abundant in the hydrated commercial cement, while none were found in the white cement. The crystalline grains, as centers of gelatinous particles, lasted for a much longer time in the latter. The presence of silicates seemed to have influenced the speed of disintegration of hydrated tricalcium aluminate crystals, since in the tests with the two varieties of cement and solutions of sodium sulfate these crystals lasted for a much shorter time than they did in the tests with pure hydrated tricalcium aluminate. Solutions of magnesium sulfate were especially destructive in their action on crystals of hydrated tricalcium aluminate, regardless of the presence or absence of calcium silicate.

The characters of the layers surrounding crystals of hydrated lime varied with the sulfate solutions used. In sodium sulfate the layers were apparent only on the edges of the lime crystals and were made up of granular masses. In magnesium sulfate solutions the lime crystals were heavily enveloped, the coating frequently consisting of a transparent homogeneous layer as well as granular masses.

The weight and lateral pressure of sunflower silage, H. E. MURDOCK (*Montana Sta. Bul. 191 (1926), pp. 19, figs. 5*).—Tests of the weight of sunflower silage and the pressure it exerts on the walls of silos are reported.

The results showed that, when thoroughly compacted, sunflower silage weighs from one and one-half to three times as much as corn silage. The lateral pressure on the walls of silos holding sunflower silage was found to be much greater than it has been assumed to be for corn silage, and for tall silos it is more than twice as great. The deductions from these two findings are that a silo of any given dimensions will hold in the neighborhood of from one and one-half to three times as much sunflower silage by weight as it will of corn silage. The hoops or the reinforcing used in building a silo for sunflower silage should be nearly double those used in building a corn silage silo.

Tables and formulas are presented giving the sunflower silage capacities of various sizes of silos and the methods of calculating the amounts of hoops or reinforcing needed in constructing such silos.

Turn the switch—let electricity do the work, T. E. HIENTON and K. McMAHON (*Indiana Sta. Circ. 134 (1926), pp. [1]+16+[1], figs. 24*).—Popular information on the use of electricity in household and barnyard belt work is presented.

Tractor lug studies on sandy soil, J. W. RANDOLPH (*Agr. Engin., 7 (1926), No. 5, pp. 178–184, figs. 8*).—Studies conducted at the Alabama Experiment Station are reported, the purpose of which was to determine the laws governing the traction of wheeled tractors.

The data presented cover a study of angle lugs with a sandy soil under laboratory conditions and include only the reaction on the machine above the soil. They show that the greatest factor in the transmission of force from any lug is the complete utilization of the arch action of the soil by the tractor. The resistance to shear was found to determine the tractive value of the soil. If the soil is confined by a rim causing arch action, the shear area is increased by bringing the line of shear more nearly parallel to the surface of the ground, the shear angle of unconfined soil being 45°. The compressing action of the rim not only increases the arch action but also the shear value per square inch.

The characteristics of a tractor taken in the order of their importance with reference to tractive value were found to be (1) the distribution of the weight on the driving wheels, (2) the depth of lugs, (3) the width of lugs, solid or broken, and (4) the angle of the lugs across the rim. With a given width of rim the output was found to increase up to a maximum as the weight carried by the wheel was increased up to a certain point. Beyond this point the output decreased. With a given weight carried by a wheel the output was found to increase with the rim width when the weight was sufficient to force the lugs into the soil. Other factors remaining constant, output was found to be proportional to the depth of lug within the range of lugs studied and varied but slightly with the width of lug.

Different types of lug were found to have advantages under different soil conditions. A solid angle iron lug was best in loose soils having slight arch action. Where there was appreciable arch action sharp spade lugs showed an advantage, since they had less resistance in entering and, due to the arch action, were able to produce the same output as, or a greater output than, a solid lug. The spacing of spade lugs was found to depend upon the arch action of the soil, which in turn was governed by the confining and compressing action of the rim. The angle of the lugs across the rim had little effect upon output. The highest tractive efficiency was produced by a weight carried by the wheel just sufficient to force the lug into the soil.

Plows and plowing, J. M. SMITH (*Alberta Univ., Col. Agr. Bul. 6, 2. ed., rev. (1926), pp. 32, pls. 3, figs. 25*).—This is the second revised edition of this bulletin (E. S. R., 44, p. 587).

Summer tillage implements, A. J. OGAARD (*Mont. Agr. Col. Ext. [Circ.] 79 (1926), pp. 43, figs. 61*).—Information relating to various types of implements used for summer tillage by many dry land farmers throughout the Northwest is presented.

Some results of tests of the operation of combines in Illinois, I. P. BLAUSER (*Agr. Engin., 7 (1926), No. 6, pp. 205–207, figs. 3*).—Studies conducted at the Illinois Experiment Station are reported which dealt primarily with the total losses in harvesting with the combine in both wheat and soy beans. The equipment consisted of a 16-in double cylinder thresher which was used to rethresh the straw collected from the threshing machine and combine. The threshed grain and the straw were collected at the same time to determine the percentage of loss. In the case of the combine a count was made directly back of the cutter bar at the same place the test was made to determine the amount left on the ground.

The losses behind the cutter bar of the binder and the combine were about the same, averaging about 0.75 bu. per acre for wheat. The loss around the

shocks averaged about 1 bu. per acre. From 0.75 to 1 bu. per acre was recovered by raking the shock rows. The loss around the shock was found to be eliminated entirely by the combine, as the material never touches the ground. The average loss for 53 threshing machines tested was 1.36 per cent, bringing the total loss by the ordinary method of harvesting and threshing to a little over 8 per cent. The average total loss from 14 tests made with the combine in wheat was a little under 6 per cent.

The saving in threshing of soy beans with the combine was much greater than by any other method of harvesting and threshing, even though the total loss was considerably higher than that in harvesting wheat. The same combine that had been used to harvest wheat, oats, sweet clover, red clover, and timothy gave an average total loss of 10.62 per cent in 14 tests in harvesting soy beans. For harvesting soy beans the cylinder speed was reduced, special shoes were put on the cutter bar, permitting the machine to cut lower, and the small grain riddles were replaced with soy bean riddles. With this combine, where the beans were standing in good shape, the loss was under 6 per cent and in no test did it go over 17.9 per cent.

Counts made during the past season back of the cutter bar of a mower, self-rake reaper, and binder in soy beans, where the yield was 36.8 bu. per acre, showed losses of 18.2, 14.6, and 25.2 per cent, respectively. Considering losses occurring between the machine used in cutting and the threshing machine and the threshing machine losses, the total losses in this series of tests were approximately 34, 30, and 41 per cent for the mower, self-rake reaper, and binder, respectively. With the special shoes and floating cutter bar the combine was found to give a lower loss behind the cutter bar than the binder. The lower cutting of mower and self-rake reaper was offset by the scattered stalks and shattered beans back of the cutter bar.

These results were taken to indicate that the combine reduces the losses considerably in harvesting and threshing.

Stationary spray plants in California, B. D. Moses and W. P. Duruz (*California Sta. Bul. 406 (1926), pp. 29, figs. 13*).—This bulletin is a contribution from the divisions of agricultural engineering and pomology of the station and the stationary spraying subcommittee of the California Committee on the Relation of Electricity to Agriculture. It is the first of a series planned to report the results of investigations conducted jointly by the station and the committee.

A stationary spray system consists of a central pumping station and pipe lines laid systematically throughout the orchard with outlets at regular intervals to which hose are attached for spraying the trees. The principal advantages of stationary spray plants were found to be that spraying may be done when necessary in spite of adverse soil or weather conditions, and that pests requiring quick action may be speedily controlled.

There was found to be a possibility of combining the advantages of the portable sprayer and the stationary spray plant by piping sections of the orchard that would be benefited and using the portable sprayer for supply and power. In this arrangement the portable rig becomes the pumping station for the permanent piping system, and at other times is available for spraying parts of the orchard where there is no pipe line.

A bibliography is included.

The farmer's shop book, L. M. Roehl (*Milwaukee: Bruce Pub. Co., 1924, pp. 432, figs. 131*).—This is a handbook of information relating to construction and repair jobs on the farm.

A method of studying farm fires, E. G. Lantz (*Agr. Engin., 7 (1926), No. 6, pp. 213, 214*).—In a contribution from the Pennsylvania Experiment Station the

methods followed in a study of farm fires and their prevention are briefly outlined and a few of the results presented.

In hay barns the seat of the heating and the subsequent ignition was found to be under or nearly under the point where the hay fork dropped the hay. As the hay was removed a cone of compressed hay was found which had formed a heat chamber. An almost universal tendency was also found to roll the large bunches of matted hay which dropped from the hay fork to one side instead of tearing them apart and leveling the mow. Temperature measurements indicated that these balls of hay were in themselves small heat chambers. It was necessary to eliminate the matted condition before a loose and well-ventilated mow was possible.

Temperature measurements at different points and depths in a mow as it was being filled showed that the heat rose through the cone of compacted hay. If the temperature was taken 3 or 4 ft. below the surface of the mow and directly at the point where the fork dropped the hay, it was rarely ever more than 5° below the highest temperature registered.

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in agricultural economics at the Illinois Station, 1925] (*Illinois Sta. Rpt. 1925, pp. 102–129*).—The results obtained during the year in investigations in progress are summarized.

In studies of farm earnings by H. C. M. Case, M. L. Mosher, and K. H. Myers, a table is given summarizing by 14 areas of one or more counties the business records of 606 farms for 1924. The rate earned on investment in the several areas varied from 3.75 to 8.22 per cent, averaging 6.25 per cent, which for the average operator amounted to $1,212.70 as payment for his labor and management after all expenses had been paid and 5 per cent allowed on capital invested. The relatively high level of grain prices as compared with the prices of livestock in 1924, together with climatic conditions, gave the grain-selling sections an unusual advantage over the heavier livestock-producing sections during 1924.

Detailed cost-accounting investigations were continued by Case, C. A. Bonnen, and H. A. Berg in 1924 for the twelfth year. Data are summarized for 1923 and 1924 for Knox and Warren Counties, and for 1920–1924 for Champaign and Piatt Counties.

A study by H. P. Rusk, Case, and R. H. Wilcox on 25 farms in McLean and Woodford Counties showed that feed constituted 84.4 per cent of the total cost of carrying the breeding herd and growing and fattening the 1924 spring pigs. An average of 433 lbs. of concentrates were fed for each 100 lbs. of gain. The loss of pigs before weaning averaged 38.5 per cent and had a marked influence on the cost of production. The profit per 100 lbs. of gain averaged $1.62, decreasing from $2.50 profit to $3.17 loss as the cost of production increased from $7 to $8 to over $12 per 100 lbs.

The average cost in 1924 of producing 100 lbs. of milk on 11 farms in DuPage, Lake, and Stephenson Counties with herds averaging 17 cows was found by Case, Bonnen, and K. T. Wright to be $3.07, and the average production per cow was 6,468 lbs. of milk. The cost and average production per cow varied on individual farms from $1.89 and 8,496 lbs. to $5.26 and 4,890 lbs. On 12 farms in Washington, Clinton, and Madison Counties with herds averaging 12 cows the average cost per 100 lbs. of milk was $1.84 and the average production per cow 6,158 lbs. The cost and average production per cow varied from $1.28 and 7,586 lbs. to $4.54 and 3,492 lbs. Feed costs per 100 lbs. of milk

produced varied from $1.35 to $3.59 on the farms in the first section and from $1.14 to $3.52 in the second section.

Survey records in 1924 on 25 tractor farms in Champaign County by R. C. Ross and R. I. Shawl showed the average yearly use of tractors to be 256.5 hours and the average hourly cost to be $1.13. Records from 18 other farms showed 298 hours of use at a cost of $1.05 per hour. Horse labor costs in 1924 averaged 14 cts. per hour for an average of 791 hours of use on 14 Champaign and Piatt County farms, and 16.4 cts. per hour for an average of 732.5 hours of work on 18 Knox and Warren County farms.

Case, R. R. Snapp, and Wilcox found the average net costs per pound of gain of feeding cattle in De Kalb County for the 5 winters 1918–19 to 1922–23 were 28 cts., 33.2, 18.1, 12.6, and 15.8 cts., respectively. The prices received per bushel of corn fed were $1.12, 30 cts., 32, 63, and 62 cts., respectively. In 1922–23 the cost of feed comprised from 76 to 79 per cent of the total cost of feeding cattle of different classes, and from 350 lbs. of corn for calves to 840 lbs. for heavy cattle was fed for each 100 lbs. of gain.

C. L. Stewart found that two out of three farm real estate transfers made in 1924 were voluntary sales, but in 58 per cent of the cases the purchaser was related to the former owner. Twelve per cent of the transfers were due to deaths, 8 per cent to bankruptcy or foreclosure, 5 per cent to voluntary relinquishment in satisfaction of mortgage debts, less than 1 per cent to tax sales, and 8 per cent to other compulsory circumstances, such as condemnation.

[Rural economics investigations at the Ohio Station] (*Ohio Sta. Bimo. Bul., 11 (1926), No. 6, pp. 245–254*).—The results of work in rural economics are given.

Farm machinery costs in Ohio, J. I. Falconer.—A table is given showing the sales price of 12 farm implements and 5 gas-driven machines in 1914 and in each of the years 1920 to 1926, inclusive. Excluding gas-driven machines, the weighted index for the price of farm machinery in 1923 was 148; in 1924, 178; 1925, 168; and in 1926, 167. Assuming that 30 per cent of the machinery cost is for gas-driven machines, the index number in 1923 was 125; in 1924, 146; and in 1925 and 1926, 138.

Summary of 4,666 farm records in Ohio from 1910–1925, J. I. Falconer.—Data from 4,666 financial summaries of the year's business on Ohio farms are tabulated under the following headings: County, principal sources of receipts in order of importance, year covered, number of farms, receipts per farm, expenses per farm, and labor income.

Feed prices, J. I. Falconer.—Tables are given showing (1) the average price in 1910–1914, and the prices in March, 1923–1926, and in September, 1926, of corn, oats, bran, tankage, oil meal, and cottonseed meal; and (2) the index of these prices using the average 1910–1914=100. The weighted index of these feeds in July, 1926, was 130 as compared with an index of 161 for all farm expenses.

Freight rates on Ohio butter, cheese, and condensed milk, C. G. McBride.—Tables are given showing the freight rates on butter and cheese from different Ohio points to different destinations during different periods from 1915 to 1926. The index of the present freight rates compared with those effective before 1915 was 190, while the index of prices paid to farmers for butter in 1925 was 170.

Index number of production, wages, and prices, J. I. Falconer.—This is a continuation through September, 1926, of the index numbers previously noted (E. S. R. 56, p. 188).

An economic study of irrigated farming in Twin Falls County, Idaho, B. Hunter and S. B. Nuckols (*U. S. Dept. Agr. Bul. 1421 (1926), pp. 75, figs.*

23).—This investigation was conducted by the Bureaus of Agricultural Economics and Plant Industry, U. S. D. A., and the Idaho Agricultural Experiment Station, and covers the years 1919 to 1922, inclusive. It includes (1) a study of the agricultural development and readjustments of the Twin Falls South Side project, (2) a business analysis of the farms studied during each of the years 1919–1922, (3) the cost of producing each of the 7 primary crops grown in 1919 to 1921, inclusive, and (4) the average cost of keeping work horses and the cost of horse labor per hour in 1921. The information was obtained by the survey method. The farms studied varied in size from 17 to 345 acres, the most frequent sizes being 40-acre, 80-acre, and 20-acre, in the order named. Cash crop farming predominated. Of the farms studied, 87 per cent were general crop farms, 7 per cent dairy and general crop farms, and 6 per cent orchard and general crop farms. The orchard and general crop farms carried very little productive livestock.

The return to capital varied during the 4 years from 1.5 to 7.2 per cent, averaging 4.1 per cent, for general crop farms; from 3.7 to 10.9 per cent, averaging 5.8 per cent, for dairy and general crop farms; and from −0.4 to 12 per cent, averaging 5.2 per cent, for orchard and general crop farms. The size of farm had considerable influence on the economical organization and operation of the general crop farms. The 40-acre farms had 5 per cent more of the total capital tied up in buildings and equipment than had the 80-acre farms. On the 80-acre farms a little over 15 acres of crops were handled per work horse and 4.2 crop acres per month of man labor, as compared with 10 and 2.8 acres, respectively, on the 40-acre farms. Yields were slightly higher on the 40-acre farms, but the net returns per acre for use of real estate for the 4-year period varied from −$1 to $24, averaging $7.75, for 40-acre farms, and from $3 to $33, averaging $14.25, for 80-acre farms.

None of the 7 leading field crops showed an average net return per acre in more than 2 of the 4 years studied, no one of them showed a loss each year, and in no year did all the crops show losses. The average number of hours of man labor used per acre in producing the different crops in 1919–1921 were for wheat 25.1, alfalfa hay 30.8, sugar beets 131.6, potatoes 101.4, beans 57.2, red clover seed 24.9, and alsike clover seed 21.7. The average number of hours of horse labor were 44.3, 32, 117.6, 100.2, 57.1, 22.6, and 15.1, respectively, for the different crops.

The 151 farms on which cost of horse labor was studied in 1921 averaged 75 acres, and there was an average of 4.7 work horses per farm. An average of 703 hours of work was done per horse at a cost of 7.8 cts. per hour. The average cost per horse per year was $55.15, of which 63 per cent went for feed.

Farming for profits: Anderson and similar areas of South Carolina, W. C. Jensen (*South Carolina Sta. Bul. 230 (1926), pp. 69, figs. 22*).—This bulletin is based upon surveys made by the station from 1922 to 1925, inclusive, to determine the most economic farm organizations and practices in Anderson County, S. C., and a study made by the Office of Farm Management, U. S. D. A., in the same area in 1914. The results of the work in 1922 have been previously noted (E. S. R., 52, p. 588).

Farm organization or combination of crops and livestock, acres of cotton per farm, and value of cotton per acre are deemed the most important factors determining the financial success of this area. In the years 1922, 1924, and 1925 the best farms averaged 103 acres in crops, 22.9 acres of crops per mule, and 12.9 acres of cotton per mule; the average farms 75 acres in crops per farm, 19.7 acres of crops per mule, and 10.9 acres of cotton per mule; and the poorest farms 66 acres in crops, 18.8 acres of crops per mule, and 10.1 acres of cotton per mule. Each 1.5 acres of cotton per mule increased the

gross cash income per mule approximately $100, using 1924 prices. A multiple correlation analysis shows that operator's earnings increased rapidly with the increase in the acreage of cotton grown from 5 acres up to nearly 200 acres, and also with the increase in the acreage value of cotton from $40 or less to $180.

The cost of producing cotton in 1924 decreased 3.2 cts. per pound with each 100 lbs. per acre increase in the yields of lint cotton. Large increases in yields resulted from increased mixed fertilizer applications of over 300 lbs. up to approximately 600 lbs. per acre, and with increased applications of nitrate of soda from 40 to approximately 160 lbs. per acre.

For each mule used on the farm the following acreages are recommended: Cotton 12.5, corn 5, oats 2.5, wheat 0.8, cowpea hay after grain 2.5, alfalfa hay 0.3, miscellaneous and other crops 1.4, and winter cover crops 8.5 acres. Sufficient livestock should be carried on each farm to supply meat, eggs, and dairy products for family needs.

Tables are given showing the recommended crop plan for a 4-mule farm, best-average-poorest farm data, production cost of different crops, and returns from using different amounts of fertilizer with cotton and fertilizers at different prices. Tables of average quantity expenditures and costs in 1924 are given for 20 dairy, 20 poultry, and several truck farms in the Greenville area.

Economic studies of dairy farming in New York, VI, VII, E. G. MISNER (*New York Cornell Sta. Buls. 452 (1926), pp. 3–58, figs. 2; 455 (1926), pp. 3–51*).—These bulletins report the results for the years ended April 30, 1923 and 1924, of the study previously noted (E. S. R., 54, pp. 584, 585). Eighty-eight farms were studied the first year and 95 farms the second year. Some of the more important data for the two years are summarized in the following table:

Averages per farm of important business factors for the years ended April 30, 1923 and 1924

Kind of business factor	1923	1924
Size of farm ... acres	151	162.8
Acres in crops	59	59.2
Acreage pastured	60.4	75
Number of cows, average	22	23
Capital	$16,060	$15,546
Receipts:		
Crops	$592	$1,027
Livestock sold	$713	$862
Milk sold	$2,761	$3,061
Miscellaneous	$484	$477
Expenses:		
Total	$3,714	$4,087
Operating	$3,221	$3,509
Farm income	$836	$1,160
Labor income	$32	$383
Net income ... per cent	None.	1.2
Monthly cash living costs of operator	$62	$60
Number of men, including operator	2.19	2.2
Percentage of labor done by operator and family	67.1	66
Rate per hour for operator's labor	$0.31	$0.23
Rate per hour for hired labor	$0.29	$0.23
Rate per hour for horse labor	$0.18	$0.17
Returns above all other costs per hour of labor:		
Summer dairies	$0.133	$0.099
Winter dairies	$0.284	$0.127
Milk per cow ... pounds	6,306	6,753
Price received per 100 pounds of milk	$2.12	$2.12
Cost of producing 100 pounds of milk	$2.25	$2.44
Cost per pound of butterfat	$0.70	$0.78
Loss per cow	$13.35	$20.25
Cost of raising a heifer to age of freshening	$109	$116
Productive man-work units per man	247	226
Productive horse-work units per work animal	64	63
Acres of crops per man	26.9	26.7
Acres of crops per work animal	16.2	16.5

In 1922, 40 farmers failed to make interest, 33 made labor incomes of from $1 to $1,000, and 15 made labor incomes over $1,000. In 1923, 33 did not make interest, 38 made from $1 to $1,000, and 24 made over $1,000.

Tables are included in each bulletin summarizing the uses of fertilizer, lime, and manure for different crops; giving the labor distribution; and showing important business factors for each farm studied. Each bulletin has a tabulated summary for use in comparing individual farms with the average. Bulletin 452 briefly discusses 5 farms successfully operated in 1922, and 3 farms out of 76 in the Earlville region having labor incomes of over $1,000 in 3 consecutive years.

Factors in the cost of producing beef in the Flint Hills section of Kansas, R. H. Wilcox, W. E. Grimes, M. Evans, and H. J. Henney (*U. S. Dept. Agr. Bul. 1454 (1926), pp. 27, figs. 9*).—This bulletin presents the results of a study made from 1921 through 1923 by the Department and the Kansas Experiment Station of the cattle industry in the Flint Hills section—a rough section of over 3,000,000 acres in the central and southern part of the eastern half of Kansas. The study was made to ascertain the number of acres of grass required to put normal gains on steers, the methods used in handling steers, the factors in the costs of grazing, and the economic position of summer grazing in Kansas in relation to the beef-cattle industry and to the markets for livestock.

Methods and practices of retailing meat, W. C. Davis (*U. S. Dept. Agr. Bul. 1441 (1926), pp. 24, figs. 9*).—This bulletin is the first of a series of three giving the results of a survey of the retail marketing of meat conducted by the Bureau of Agricultural Economics. The study of methods and practices covered by this bulletin was made in 1924 and 1925 in 20 cities scattered throughout the United States. A total of 1,404 stores were studied, of which about 600 belonged to chain systems and 800 were independent shops. The number of stores in relation to population, their location, volume and character of business, practical knowedge of the proprietor, sources of supplies and methods of buying, facilities and equipment, selling and operation practices, frequency of turnover, price determinations, spread between wholesale cost and retail prices, and other factors were studied and recommendations made for eliminating the weaknesses and deficiencies of the industry.

The number of persons per store ranged from 300 to 700 in the different cities. Efficiency in operation was found to be due more to the qualifications and practical knowledge of the management than to the size, number of units, or capital employed.

Margins, expenses, and profits in retailing meat, K. B. Gardner (*U. S. Dept. Agr. Bul. 1442 (1926), pp. 56, figs. 3*).—This bulletin is the second of the series on the retail marketing of meat noted above and is based upon data collected in 16 cities of the United States. These data were obtained from 142 individual retail straight meat markets in 1923, 111 such markets in 1924, and from a smaller number of semiwholesale markets, combination stores, retail chain stores, and semiwholesale and retail chain meat markets.

Data were obtained from 74 individual straight retail markets in both years and showed that the percentage of gross margins, expenses, and profits based on net sales was practically the same in the two years. An analysis based on 129 of these shops in 1923 which had net sales of over $14,000 showed the various items of margin, expense, and profit in the percentages of net sales to be as follows: Gross margin between cost and receipts 23.56 per cent, profits 3.01, total expenses 20.55 divided into salaries and wages 13.16, rent 2.48, wrapping 0.97, refrigerating 1, light and power 0.33, depreciation 0.42, and

other expenses 2.49 per cent. Of these 129 markets, 21.7 per cent were operated at a loss when proprietor wages were included, 30.2 per cent showed a profit of less than 3 per cent of the sales, 27.1 per cent profits of from 3 to 6 per cent, 14.7 per cent profits of from 6 to 9 per cent, and 6.3 per cent profits of over 9 per cent. The average profits for carry stores were 3.24 per cent, limited delivery stores 2.29, and unlimited delivery stores 3.23 per cent.

Delivery costs amounted to 5 per cent of the delivered sales. The absolute cost of retailing meat was found to have changed but little from 1919 to 1922, when gross margins, expenses, and profits were related to a common base (1913).

An analysis of the data gathered from other than individual retail straight meat markets is also made.

Crops and Markets [for November, 1926] (*U. S. Dept. Agr., Crops and Markets, 6 (1926), Nos. 20, pp. 305–320; 21, pp. 321–336; 22, pp. 337–352; 23, pp. 353–368*).—The usual tabulations, notes, summaries, etc., are given for livestock, meats, wool, fruits, vegetables, grain, hay, cotton, feed, dairy and poultry products, and foreign crops and markets by weeks from November 1 to 27, 1926.

Monthly Supplement to Crops and Markets [November, 1926] (*U. S. Dept. Agr., Crops and Markets, 3 (1926), Sup. 11, pp. 345–384, figs. 5*).—The usual tables, charts, comments, and summaries are included for crops, dairy products, fruit and vegetable shipments, livestock and livestock products, seeds, cold storage holdings, prices, world agriculture, etc. Special reports are given for the cattle and lamb feeding situations October 1 and November 1. Special tables are presented showing the acreage and condition of the cotton crop October 18 and November 1; the acreage and yield per acre of cotton; the production, value, and annual prices of cotton and cottonseed by States, 1910–1926; the estimated monthly marketings of cotton by States, 1922–1925, and by years, 1910–1926; and the monthly farm prices of cotton and cottonseed by years, 1910–1926.

FOODS—HUMAN NUTRITION

Nutritional physiology, P. G. STILES (*Philadelphia and London: W. B. Saunders Co., 1924, 5. ed., pp. 307, pls. 3, figs. 20*).—A revision of the work previously noted (E. S. R., 51, p. 163).

Food selection and expenditure in a college community, M. M. KRAMER and E. GRUNDMEIER (*Jour. Home Econ., 18 (1926), No. 1, pp. 18–23*).—This paper summarizes the results of a dietary survey conducted in a late fall or winter month on 465 students at the Kansas State Agricultural College in 10 sorority and 7 fraternity houses and 3 boarding houses for men. All of the houses represented were managed without the assistance of a dietitian. In all cases records were kept of the meals served and of foods used in the specific time, with quantity, quality, and retail costs. From these figures calculations were made of calories of energy, grams of protein, phosphorus, calcium, and iron, and cost per man per day.

The energy figures ranged from 1,856 to 3,761 calories, with an average of 2,889 per day. The protein averaged 85 gm., or 340 calories per 3,000 calories, and in no case furnished less than 10 per cent of the total energy. As judged by the Sherman standards, calcium was inadequate in 75 per cent, phosphorus in 70 per cent, and iron in 50 or 60 per cent of the groups. The cost per man per day ranged from 24.1 to 52.8 cts., with an average of 35.6 cts. The five dietaries having the highest cost per 100 calories had more mineral deficiencies than the five showing the lowest cost. A comparison of the cost distribution among the different classes of foods with the Sherman standards indicated that

the deficiencies in the diet could be made up without more cost by more careful selection, including a more liberal use of milk and cheese and of whole grain products and a wiser choice of fruits and vegetables.

Feeding problems in college communities, E. I. RAITT (*Western Dietitian, 1 (1926), No. 6, pp. 11–13, 38, 39, figs. 4*).—A dietary survey similar to the foregoing has been made at the University of Washington in 12 organized houses for college women, serving a total of 1,200 meals daily. The records were made in January and February, 1926, and were collected and summarized by R. S. Godfrey.

Averaged by houses, the minimum, maximum, and average energy values were 2,249, 3,160, and 2,667 calories per person per day. The protein averaged 80 gm. per person, or 120 gm. per 3,000 calories, and an average of 65 per cent of it was of animal origin. Five of the 12 groups fell below the 0.67 gm. per day of calcium recommended by Sherman as the minimum allowance, 8 below 1,32 gm. of phosphorus, and all but 1 below 0.015 gm. of iron. Estimated for 3,000 calories only 1 group was short on calcium, 3 on phosphorus, and 5 on iron. The minimum, maximum, and average expenditures for food were 32, 49, and 42.7 cts. The houses least successful in the mineral allowance all spent above the average, while of those furnishing a sufficient supply of minerals 2 were above and 3 below the average total expenditure.

On the basis of the distribution of total food expenditures among the different classes of foods as compared with the standards recommended by Sherman, it is considered that the present diets might be improved by a slight reduction in the meat and an increase in vegetables and fruits in season and in eggs, milk, and cheese.

A square meal, R. H. A. and V. G. PLIMMER (*Hygeia [Chicago], 4 (1926), No. 11, pp. 611–614, figs. 11*).—A novel scheme for the diagrammatic representation of complete and incomplete diets is explained and illustrated. A balanced diet supplying all the materials needed by the body is represented by a circle inclosed in a square. The upper half of the circle represents the calories supplied by fat and carbohydrates and the lower half water and salts. Three of the four corners of the square not filled by the circle represent vitamins A and D, B, and C, and the fourth protein. The absence or shortage of these constituents of the diet can be shown by the removal or cutting off of the corners, and an excess of any constituent inside or outside the circle by suitable enlargements. Examples of poorly balanced diets are given with accompanying diagrams.

Nutritive value of protein in beef extract, ox blood, ox palates, calf lungs, hog snouts, and cracklings, R. HOAGLAND and G. G. SNIDER (*Jour. Agr. Research [U. S.], 33 (1926), No. 9, pp. 829–843, figs. 8*).—Following the method employed in previous studies along the same line (E. S. R., 55, p. 487), the authors have determined the nutritive value of various meat products having limited use as human food.

With the exception of calf lungs, the protein of which proved to be of fair quality, all of the products tested were inadequate as the sole source of protein for young rats. Dried blood and hemoglobin were so distasteful to the rats that the food consumption was too low to afford any evidence of the nutritive value of the protein. Of the other materials, serum protein, hog snouts, and pork cracklings fed at a 15 per cent level proved adequate for maintenance but not for satisfactory growth, and beef extract was inadequate for maintenance at an 18 per cent level.

The biological value of bread-protein, M. HINDHEDE (*Biochem. Jour., 20 (1926), No. 2, pp. 330–334*).—The author takes exception to the low figures

reported by Martin and Robison for the biological value of the proteins of wheat from a 25-day test (E. S. R., 47, p. 765), and presents data from metabolism experiments conducted on two subjects for a period of 126 days showing that nitrogen equilibrium is possible on a diet furnishing only 22 gm. daily of digestible protein in the form of rye bread. The ability to continue for such a long period on a low nitrogen diet and at the same time maintain the caloric requirements is attributed to the use of a comparatively large amount of fruit.

A study of the laxative action of wheat bran, G. A. WILLIAMS (*Soc. Expt. Biol. and Med. Proc., 23 (1926), No. 8, pp. 630, 631*).—Preliminary studies conducted on dogs are reported which indicate that the laxative effect of wheat bran is largely due to its content of crude fiber, this being a more powerful laxative than an equal amount of powdered agar.

Peas in the diet, A. L. MARLATT (*Canner, 63 (1926), No. 22, pp. 29, 32*).—This paper contains a brief description of the commercial process of canning peas, an explanation of the meaning of the various trade names for canned peas, and suggestions for the selection of various types of canned peas for different uses in the diet.

Cellulose sausage casings, W. F. HENDERSON and H. E. DIETRICH (*Indus. and Engin. Chem., 18 (1926), No. 11, pp. 1190–1194, figs. 2*).—A brief description is given of the various stages in the research work which has been conducted for the past 10 years at the Mellon Institute of Industrial Research under the Food Container Fellowship for the purpose of devising an edible synthetic substitute for the animal casings used for packing sausages. The material finally adopted is cellulose derived from high grade purified cotton linters. This is treated by the viscose process and manufactured by the use of specially designed machinery into thin-walled seamless tubes. The cellulose cases have the advantage over the intestinal casings from the standpoint of the manufacturer in requiring no preliminary treatment and being easier to fill, and from the standpoint of the consumer in being more satisfactory from every hygienic and sanitary angle.

Studies on the effect of heat on milk, I, II, H. E. MAGEE and D. HARVEY (*Biochem. Jour., 20 (1926), No. 4, pp. 873–891, figs. 4*).—The question of the nutritive properties of pasteurized milk as compared with fresh milk is considered in a series of papers, the first two of which are noted below.

I. *Some physico-chemical changes induced in milk by heat.*—In this study of the changes brought about in the state of some of the constituents of milk by varying amounts of heat, whole fresh milk and whole milk pasteurized at 65° C. (149° F.) for 30 minutes were compared for their content of soluble calcium after precipitation of the proteins with colloidal ferric hydroxide. As thus determined 85 per cent of the total CaO was found in solution in the whole fresh milk and 71 per cent in the pasteurized milk. In the other experiments reported, three kinds of milk were used—fresh milk, consisting of skim milk 3 hours after milking; pasteurized milk, prepared by holding skim milk at a temperature of 70° for 30 minutes in a flask immersed in a water bath; and boiled milk, prepared by holding the milk in a flask immersed in a water bath for an hour at boiling temperature. After coagulation by rennin an average of 22.72 per cent of the total CaO was found in the whey in the case of fresh milk, 20.73 in the pasteurized, and 18.52 per cent in the boiled milk. On dialysis against running water, the percentages of total CaO in diffusible form in the fresh, pasteurized, and boiled milk were about 26, 20, and 15 per cent, respectively. A study of the colloidal properties of the three samples suggested the probability that the losses in CaO after heating are due to the formation

of colloidal $Ca_3(PO_4)_2$ from the soluble $CaHPO_4$. Precipitation of amorphous or crystalline $Ca_3(PO_4)_2$ could not be detected.

Tryptic digestion experiments in vitro showed no change in the digestibility of the milk as the result of heating.

II. *The influence of diets of fresh and treated cow's milk on the calcium, phosphorus, and nitrogen metabolism of the young pig.*—Metabolism experiments conducted on young pigs are reported, the results of which indicate that "the retention of calcium, phosphorus, and nitrogen by young animals is lower on a diet containing heated milk than on one containing fresh or sour milk, and further that the addition of soluble calcium to the heated milk ration increases the amount of calcium, phosphorus, and nitrogen retained by more than the weight of the calcium added. The changes in the state of the colloids described in our first paper had evidently no effect on the assimilation of nitrogen. It is therefore suggested that the reduction in the soluble calcium by heat is an important factor in the lowering of the retention of calcium, phosphorus, and nitrogen of young animals fed on heated milk as compared with raw milk."

Peptic digestion of cow's milk, J. H. Hess, E. M. Koch, and Z. C. Sennewald (*Jour. Amer. Med. Assoc., 87 (1926), No. 17, pp. 1360–1364, figs. 4*).—Various milk modifications commonly used in infant feeding have been compared with reference to the rate of gastric digestion and to the relative importance in the digestion process of the character of the curd and the H-ion concentration. The digestion experiments were conducted in vitro, with quantitative determinations of the increase in soluble nitrogen as the result of digestion and with an examination of the curd and a determination of the H-ion concentration. The results were checked by feeding the milk to young puppies and obtaining the curds at 0.5, 2, and 3 hours by induced vomiting.

The experiments in vitro showed that the solubility of milk proteins is decreased by boiling and by such increased acidity as occurred in the range of the experiments, and is increased by the introduction of weakly acid anions, by buffer salts, and by autolysis. Aside from the physical character of the curd, a lowered pH and previous denaturization of the protein are considered to be important factors in influencing the peptic digestion of milk proteins. The excellent results obtained with cultured lactic acid milk are attributed to the combination of small curd formation, low pH, and the tendency to denaturization of the protein. Orange juice milk (56 cc. of orange juice per liter of milk) gave the highest total soluble nitrogen. Lemon juice milk (21 cc. per liter) was not as readily digested in vitro as other acid milks of similar pH.

In the feeding experiments the curds obtained with raw and pasteurized milk were large and tough and those with boiled and acidified milk small. The alkaline modifications prevented curd formation until the milk had been in the stomach for half an hour.

Although cultured lactic acid milk proved superior to all other acid milks in digestibility, orange or lemon juice is recommended as the most logical addition to raw, pasteurized, or boiled milk for continued feeding on account of its high content of vitamins and mineral constituents and additional buffer salts. Raw egg yolk as previously suggested by Hess and Mitzner (E. S. R., 51, p. 867) is also recommended in addition to one of the fruit juices.

The production and handling of human milk, H. D. Chapin (*Jour. Amer. Med. Assoc., 87 (1926), No. 17, pp. 1364–1366*).—This is a discussion of the production and handling of human milk by the Children's Welfare Federation of New York since October 6, 1921, with data on the specific gravity and the fat, protein, and lactose content of 44 different samples of pooled milk and on its keeping qualities.

The nutritive value of inorganic substances.—I, A study of the normal zinc metabolism, with particular reference to the calcium metabolism, L. T. FAIRHALL (*Jour. Biol. Chem.*, *70* (*1926*), *No. 2*, *pp. 495–512*, *figs. 6*).—In this investigation the metabolism of zinc in rats has been studied under conditions of normal, acid, and alkaline feeding. The diet used throughout consisted of cracked wheat 21.3, corn meal 21.3, rolled oats 35.6, milk powder (Klim) 14.2, liver powder 4.7, and yeast powder 2.8 per cent, with a small weekly allowance of fresh lettuce. During the normal periods the animals drank distilled water from burettes, and during the acid and alkaline periods ammonium chloride (1 M decreasing to 0.4 M) and sodium bicarbonate (0.1 M), respectively. The experiment continued 3 weeks on the normal, 7 on the alkaline, 1 on the normal, and 15 on the acid feeding. The food mixture was analyzed frequently for zinc and calcium and the weekly output of urine and feces tested separately for zinc and calcium.

The average daily intake per rat during the water periods amounted to 0.48 mg. of zinc and 19.1 mg. of calcium and the excretion 0.44 and 15.1 mg., respectively. The calcium storage was of the same order as reported by Sherman and MacLeod for adult rats (E. S. R., 54, p. 593) and the storage of zinc about 1 per cent of that of calcium. A further proof of the storage of zinc in the organism of the growing rat is afforded by analyses for calcium and zinc of the bodies of rats at various ages of from 7 to 210 days. During this time the calcium content rose from 0.069 to 3.016 gm. and the zinc from 0.37 to 8.2 mg. Values obtained for the zinc content of the blood of 2 adult rats were 0.68 and 0.79 mg. per 100 gm. and of calcinm 10.2 and 10.4 mg., respectively.

During the alkaline feeding the excretion of zinc in both the urine and feces was at first increased and later returned to normal. During the acid feeding there was a similar increase in excretion, but the balance continued to remain negative until normal feeding was resumed. The calcium metabolism was not affected by the alkaline diet, but the excretion of calcium was slightly increased on the acid diet. These data indicate that zinc is less firmly retained in the body than calcium.

Data are also given on the zinc content of a number of foods and on the fecal zinc excretion of a man on normal diets. It is estimated that man consumes from 10 to 15 mg. of zinc daily and excretes about 1 mg. daily in the urine. The fecal excretion as judged by the data presented fluctuates widely with the amount of zinc ingested.

The value of egg yolk in supplementing diets deficient in calcium, E. TSO (*Amer. Jour. Physiol.*, 77 (*1926*), *No. 1*, *pp. 192–198*, *figs. 6*).—In this complete report of a study previously noted from a preliminary report (E. S. R., 52, p. 260), further evidence is given of the value of egg yolk in supplementing diets deficient in calcium. In the feeding experiments reported, 5 per cent of egg yolk proved as satisfactory a supplement to the deficient diet as 2 per cent of cod-liver oil.

"The results of these experiments have a practical bearing of fundamental significance on the problem of feeding young children in such a country as China where cow's milk is little used. To most households the cost of milk seems almost prohibitive. On the other hand, the cost of eggs is extremely low. Therefore, the addition of one or two eggs a day to the diet of Chinese children should be of immense value not only in enhancing its vitamin A and vitamin B content and its protein quality, but in improving the calcium metabolism and safeguarding the body against calcium starvation."

The relation of anemia, primary and secondary, to vitamin A deficiency, K. K. KOESSLER, S. MAURER, and R. LOUGHLIN (*Jour. Amer. Med. Assoc.*,

87 (1926), No. 7, pp. 476–482, figs. 3).—The theory upon which the experimental work and specific recommendations for the dietary treatment of pernicious anemia reported in this paper are based is that in pernicious and other severe anemias "the blood changes and the changes in the gastrointestinal tract may be due to vitamin A underfeeding over a long period of years. The nervous symptoms might be related to an absence or deficient quantity of vitamin B. The tendency to hemorrhages found in severe anemias may be due to the partial or complete lack of vitamin C. This theory does not assume to invalidate the importance of bacterial poisons for the pathogenesis of pernicious anemia. The tissue changes brought about by the chronic vitamin deficiency may facilitate the action of these poisons."

In support of this theory, particularly in respect to the effect of deprivation of vitamin A, data are given on the blood changes in rats following variations in the vitamin A content of the diet, including total lack, chronic deficiency or underfeeding, and an abundant supply. These data are thought to prove that "the addition of a small quantity of vitamin A to the diet of an animal, long depleted in its vitamin reserve, brings about rapid formation of new red blood cells. The rate and intensity of this regeneration is, within reasonable limits, a function of the quantity of the vitamin added. Blood regeneration can not take place without the presence of vitamin A. Rats while in a state of chronic vitamin A deficiency develop a severe anemia, which, after ample vitamins are added to the diet, shows the typical blood picture of an early Addison anemia, characterized by all the features of rapid blood regeneration."

Assuming that the same conditions hold in human beings, it is recommended that the treatment of pernicious and other severe anemias be based upon the replenishment of the body with vitamins through a proper dietary management. Included in the specific recommendations for dietary treatment are cod-liver oil (5 cc. four times daily), 6 yeast tablets equivalent to 200 mg. of concentrated yeast extract, 50 or 60 gm. of butter, 6 or 7 glasses of milk, ½ pint of cream, 2 or 3 egg yolks or whole eggs, together with an abundance of fruits and vegetables, whole-wheat bread made with milk, and in place of muscle meat liver, kidney, sweetbreads, or brains.

Treatment of pernicious anemia by a special diet, G. R. Minot and W. P. Murphy (*Jour. Amer. Med. Assoc., 87 (1926), No. 7, pp. 470–476, fig. 1.*)—A diet composed especially of foods rich in complete protein and iron, particularly liver, and containing an abundance of fruits and fresh vegetables and very little fat, has been given to a series of 45 patients with pernicious anemia for periods varying from 6 weeks to 2½ years, with promising results in prompt remission of the anemia, rapid increase in red blood corpuscles and hemoglobin count, and improvement in clinical appearance. The use of an abundance of liver and muscle meat was suggested by the experimental work of Whipple and Robscheit-Robbins on blood regeneration in severe anemia (E. S. R., 53, p. 867), as well as other observations in the literature, abundant references to which are given as footnotes.

A differentiation between the water-soluble growth-promoting and antineuritic substances, S. M. Hauge and C. W. Carrick (*Jour. Biol. Chem., 69 (1926), No. 2, pp. 403–413, figs. 5.*)—The literature on the identity or nonidentity of the water-soluble growth-promoting vitamin B and the antineuritic vitamin is reviewed briefly, and a further study of the question is reported in which corn and yeast were compared as to both of these properties by carefully controlled feeding experiments conducted on baby chicks.

On 30 per cent corn as the sole source of vitamin B in an otherwise complete diet, the chicks grew slowly and showed no symptoms of polyneuritis during

the 18 weeks of the test. On the same amount of yeast the chicks grew rapidly, but nearly all developed polyneuritis during the tenth week and died within 2 weeks thereafter. On 20 per cent corn and 10 per cent yeast, growth was rapid and only a few cases of polyneuritis developed. On lower levels of corn and yeast some polyneuritis developed in all of the lots. Growth was rapid with as small an amount as 10 per cent of yeast, and slow even with large amounts of corn. That the superior growth-promoting properties of the yeast were not due to its protein was demonstrated by equally favorable results when a water extract of the yeast was used in place of the dried yeast, and when purified casein to the extent of 25 per cent was substituted for the 20 per cent meat residue and 5 per cent degerminated corn of the basal ration.

The authors conclude that the antineuritic vitamin and the water-soluble growth-promoting vitamin are not identical and that the yeast used was low in the antineuritic vitamin and rich in the water-soluble growth-promoting vitamin, while the corn was relatively rich in the antineuritic vitamin but poor in the growth-promoting vitamin.

The production of antirachitic properties in human milk resulting from irradiation of the mother, A. F. Hess, M. Weinstock, and E. Sherman (*Soc. Expt. Biol. and Med. Proc.*, *23* (*1926*), *No. 8*, *pp. 636–638*).—The authors have demonstrated the possibility of increasing the antirachitic properties of human milk by irradiation of the mother. While human milk in 25-cc. daily doses proved incapable of healing rickets or increasing the inorganic phosphorus content of the blood in rats made definitely rachitic by means of the Sherman-Pappenheimer low phosphorus diet, the same amount of milk from the same woman brought about definite healing and raised the inorganic phosphorus content of the blood of another series of rachitic rats after the woman had been irradiated every other day for a month by means of a mercury vapor lamp.

"It seems that an experiment of this kind has a definite application to pediatrics. It clearly indicates the value of ultra-violet irradiation of the mother during lactation as a preventive of rickets in the baby. Probably during the winter months when the infant is most in need of protection from rickets the intensity of sunlight is insufficient to produce this property in the milk."

The effect of irradiation of the environment with ultra-violet light upon the growth and calcification of rats, fed on a diet deficient in fat-soluble vitamins.—The part played by irradiated sawdust, II, E. M. Hume and H. H. Smith (*Biochem. Jour.*, *20* (*1926*), *No. 2*, *pp. 335–339*).—The favorable effect of irradiated sawdust on the growth and calcification of the bones of young rats on a diet deficient in fat-soluble vitamins (E. S. R., 53, p. 264) is attributed to the consumption of small amounts of the sawdust, a conclusion previously reached by Nelson and Steenbock (E. S. R., 53, p. 264).

A note on the production by irradiation with ultra-violet light of antirachitic properties in sterols derived from the small Siak Illipe nut (Palaquium burckii), E. M. Hume and H. H. Smith (*Biochem. Jour.*, *20* (*1926*), *No. 2*, *pp. 340–342*).—It is reported that mixed sterols prepared from the fat of the small Siak Illipe nut, *P. burckii*, acquire antirachitic properties on irradiation in the same way as cholesterol and phytosterol, but contain no appreciable amount of vitamin A either before or after irradiation. The authors' technique for determining vitamin D is as follows:

Young rats are placed on a diet deficient in fat-soluble vitamins at a weight of about 40 gm. and are kept on this diet for 33 days, at which time they are growing very slowly. Under these conditions the application of an antirachitic stimulant through irradiation or food is followed by growth at a much more

rapid rate for a time, followed by a decline in weight and death. The bones of such rats are more highly calcified than the controls. The basal diet is composed of inactivated caseinogen, starch, hardened cottonseed oil, marmite, lemon juice, and a salt mixture. The material to be tested is given embedded in a small pellet of white bread and hardened cottonseed oil, the control rats receiving the pellet without the material to be tested.

Puffer fish oil; a very potent antirachitic; its elaboration by fish deprived of sunlight, A. F. HESS and M. WEINSTOCK (*Soc. Expt. Biol. and Med. Proc., 23 (1926), No. 6, pp. 407, 408*).—This brief note is of interest as indicating that the antirachitic potency of fish liver oil is dependent on the diet of the fish rather than on the action of ultra-violet radiations. Puffer fish from a batch some of which had been used for tests for antirachitic vitamin were kept for three months in an aquarium away from sunlight. During this time the livers became exceptionally rich in oil, the average amount increasing from 5 to 55 per cent. The oil at the end of three months was as rich in vitamin A as that tested at the beginning of the experiment. The diet of the fish consisted largely of herring, which is rich in antirachitic vitamin, and this is thought to account for the richness of the oil in this vitamin.

Studies on experimental rickets.—XXVII, Variation of vitamin D content of butterfat as a factor in the development of rickets induced by diets suitable for preparing rats for the line test, E. V. McCOLLUM, N. SIMMONDS, J. E. BECKER, and P. G. SHIPLEY (*Jour. Biol. Chem., 70 (1926), No. 2, pp. 437, 438*).—Attention is briefly called to the necessity of keeping the butterfat in rickets-producing diets as low as possible on account of its varying content of vitamin D. On changing the source of butterfat in experiments in which the diets recommended in the previous paper of the series (E. S. R., 54, p. 295) were used, protection against rickets was secured with 5 per cent of the butter, but not when this was lowered to 1 and 2 per cent. The necessity is also pointed out of maintaining a constant phosphorus and calcium content in rickets-producing diets when used for testing natural foods for vitamin D. "Regulation of the phosphorus content can be accomplished by replacing a part of either the casein, gelatin, or egg albumin and a part of the dextrin if necessary by such an amount of the food to be studied as will equal these in protein and phosphorus content."

Concentrated orange juice, source of vitamine C, C. P. WILSON (*Calif. Citrogr., 12 (1926), No. 1, pp. 2, 20, 21*).—This paper consists chiefly of a review of papers by Goss (E. S. R., 53, p. 458) and Priston (E. S. R., 55, p 194) on the preparation and antiscorbutic properties of a commercial concentrated orange juice preparation, "Califorange."

The present status of our knowledge of the etiology of pellagra, J. GOLDBERGER (*Medicine, 5 (1926), No. 2, pp. 79–104, figs. 5*).—This is a discussion of various theories concerning the etiology of pellagra, leading up to the author's present theory that it is due to the lack of a pellagra-preventing vitamin P–P, possibly identical with vitamin B.

Simple goiter and its prevention, D. MARINE (*Jour. Amer. Med. Assoc., 87 (1926), No. 18, pp. 1463, 1464*).—A brief summary of modern views concerning the cause of simple goiter and the best means for its prevention. "One can say that the factors which cause simple goiter center about the supply of iodine and the needs, normal and abnormal, of the thyroid gland for iodine. Supplying this element in amounts that can be considered as roughly approximating the physiologic needs of the body has resulted in completely controlling the disease both in man and in animals."

TEXTILES AND CLOTHING

Collecting the literature of textiles, C. F. GOLDTHWAIT (*Amer. Dyestuff Rptr., 15 (1926), No. 20, pp. 802, 803*).—The filing system outlined has been applied to almost the whole textile field from raw materials to clothing, including textile chemistry.

The flax, hemp, and jute year book, compiled by H. R. CARTER (*Belfast: H. R. Carter, 1926, 3. ed., rev., pp. 276, pls. 35, figs. 27*).—This manual reviews the history and commercial status of flax, hemp, and jute, and describes in some detail the processes involved in preparing textiles therefrom. Mechanical information and a technical glossary in English, French, and German are also included.

Application of X-rays in the textile industry, G. L. CLARK (*Amer. Dyestuff Rptr., 15 (1926), No. 20, pp. 788–795, figs. 10*).—This contribution from the Massachusetts Institute of Technology shows the nature of X-rays and the types of information to be gained from X-ray photographs of textile materials. The results of X-ray studies on cellulose are summarized, and it is shown that information of value may also be obtained by the use of X-ray methods in the study of dyes.

Molecular structure of plant fibers determined by X-rays, O. L. SPONSLER (*Jour. Gen. Physiol., 9 (1926), No. 5, pp. 677–695, figs. 10*).—According to this contribution from the southern branch of the University of California, the wall of the plant fiber is probably built up of unit groups of atoms which have assumed the form of a space lattice. The elementary cell of the lattice is an orthorhombic structure with the dimensions $6.10 \times 5.40 \times 10.30$ Å. u., and contains two unit groups equal in size to two $C_6H_{10}O_5$ groups. The crystallographic unit cell would contain four of these elementary cells. The groups of atoms, $C_6H_{10}O_5$, are arranged in parallel chains running lengthwise of the fiber, and in each chain the odd-numbered groups have a different orientation from the even numbered. The chains parallel to one another are spaced 6.10 Å. u. in one direction and 5.40 Å. u. at right angles to that. In these two directions the odd-numbered chains also would differ in orientation from the even. On account of the cylindrical shape of the fiber, the elementary cells are arranged in the form of concentric cylinders or layers. The dimensions of the fibers are such that the fiber wall is about 40,000 elementary cells in thickness, i. e., is composed of that many concentric layers.

Studies of the bacterial decomposition of textile fibres.—IV, Note on the action of B. subtilis and B. mesentericus on cellulose, A. C. THAYSEN and H. J. BUNKER (*Biochem. Jour., 20 (1926), No. 4, pp. 692–694*).—Experiments at the Royal Naval Cordite Factory at Dorset, England, failed to show that either *B. subtilis* or *B. mesentericus* is capable of decomposing cotton fibers.

The swelling of cotton fibres, A. J. HALL (*Textile Colorist, 48 (1926), No. 575, pp. 744–746, figs. 7*).—The changes in the diameter of cotton fibers caused by the atmosphere, mercerization, washing, drying, alkalies, and acids are discussed briefly.

A test for mercerised cotton, H. MENNELL (*Jour. Textile Inst., 17 (1926), No. 5, p. T247*).—The test described consists in immersing a sample of the material, together with standard mercerized and unmercerized samples, for 2 minutes at room temperature in a mixture of 820 cc. of sulfuric acid, specific gravity 1.8, and 200 cc. of 40 per cent formaldehyde solution, washing the samples, and neutralizing with hot dilute sodium carbonate solution. The samples are then dyed in a dilute boiling bath of Chlorazol Sky Blue GW made alkaline with sodium carbonate and the colors compared. If the sample to be tested is already dyed, the color may be removed with sodium hypochlorite or hot alkaline hydrosulfite without affecting the test in any way.

On the question of the standardisation of wool in the preparation of international wool statistics, H. Hensseler (*Internatl. Rev. Sci. and Pract. Agr.* [*Rome*], *n. ser.*, *4* (*1926*), *No. 3*, *pp. 513–534*, *pls. 9*).—A detailed discussion of the method of judging the fleece and wool of sheep, used at the Technischen Hochschule of Munich.

Dyes not fast to ironing [trans. title], R. Haller (*Kolloid Ztschr.*, *38* (*1926*), *No. 3*, *pp. 248–253*; *abs. in Chem. Abs.*, *20* (*1926*), *No. 18*, *p. 3086*).—Investigation of the nature of the dyeing process when blue and violet benzidine dyes are used on cotton, wool, and acetate-silk fibers, with special reference to the reversible color change (blue to corinth red) when the dyed cotton is touched with a hot iron, confirmed the view that these dyes form colloidal solutions of different degrees of dispersion, the larger particles coloring cotton fiber blue and the smaller particles corinth red. Solutions with a low degree of dispersion are particularly sensitive to temperature changes or to variations in the medium employed. Thus in hot dye baths wool and cotton are dyed red by aqueous solutions but on cooling the color on the cotton becomes blue-violet. Alcoholic solutions hardly affect wool, but dye cotton a permanent corinth red. The effect of touching the dyed cotton with heated metal is to increase the degree of dispersion of the dye on the fabric, with change of color from blue to red.

The largest particles, which are colorless, are first deposited, then a layer of smaller violet particles, and lastly a small zone of corinth red particles. This indicates a fixed relationship between the degree of dispersion of the coloring matter and that of the adsorbent. The surface of the adsorbent plays a decisive part also when fibers are used, for swelling causes inner micellar surfaces to come into play, the difference in the sizes of these accounting for the different behavior of different adsorbents. Wool and acetate silk after swelling have larger inner surfaces than cotton. The reddening of blue dyed cotton is also produced by desiccation over sulfuric acid but to a less extent than by heating. The hypothesis of Justin-Mueller that two forms of the dye exist, one containing water and the other water free, while not consistent with all experimental facts, is applicable to the portion of the dye existing in a low degree of dispersion. The observed color changes on heating and drying may thus be connected with dehydration and simultaneous increase in the degree of dispersion.

Principles of window curtaining, M. A. Davis (*U. S. Dept. Agr., Farmers' Bul. 1516* (*1926*), *pp. II+38*, *figs. 34*).—This contribution from the Textiles and Clothing Division of the Bureau of Home Economics has been planned as a guide to the home maker in selecting, making, and hanging curtains suitable for the different rooms of an average home. The art principles of lines, proportion, balance, color, and texture and pattern with relation to window curtaining are first discussed, after which the recognized curtains for windows are classified, with the kinds of materials best suited to each. The proper selection as to type and materials of curtains for the different rooms of a house, specific directions for making the various types of curtains, and a classified list of curtain materials complete the publication, which is illustrated throughout with half tones of interiors and line drawings.

HOME MANAGEMENT AND EQUIPMENT

Convenient kitchens, G. Gray (*U. S. Dept. Agr., Farmers' Bul. 1513* (*1926*), *pp. II+30*, *figs. 31*).—This supersedes Farmers' Bulletin 607 (E. S. R., 32, p. 95). It contains practical information on the planning and arrangement of convenient kitchens and includes numerous working drawings.

MISCELLANEOUS

Report of the Guam Agricultural Experiment Station, 1925, C. W. EDWARDS ET AL. (*Guam Sta. Rpt. 1925, pp. II+20, figs. 13*).—This contains reports of the director, the assistant in agronomy and horticulture, and the entomologist, and meteorological observations. The experimental work recorded is for the most part abstracted elsewhere in this issue.

A year's progress in solving some farm problems of Illinois: Thirty-eighth Annual Report [of Illinois Station, 1925], compiled and edited by F. J. KEILHOLZ (*Illinois Sta. Rpt. 1925, pp. 191, figs. 42*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1925, a summary of the principal lines of work and publications of the year. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

Abstracts of papers not included in bulletins, finances, meteorology, index (*Maine Sta. Bul. 328 (1925), pp. 253–275+XV, pl. 1*).—This contains the organization list of the station; abstracts of 9 papers, 6 of which were previously noted and another abstracted elsewhere in this issue; meteorological observations, noted on page 207; a financial statement for the fiscal year ended June 30, 1925; an index to Bulletins 322–328, inclusive, which collectively constitute the forty-first annual report of the station; a tribute by W. H. Jordan to former Director C. D. Woods; and announcements as to the work and publications of the station.

Annual Report of [Nevada Station], 1925 [S. B. DOTEN] (*Nevada Sta. Rpt. 1925, pp. 20, figs. 2*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1925, lists of station projects and publications, and a report of the director discussing the work and problems of the station during the year. The experimental work reported is for the most part abstracted elsewhere in this issue.

Forty-fifth Annual Report of the New York State Agricultural Experiment Station [1926], R. W. THATCHER (*New York State Sta. Rpt. 1926, pp. 69*).—This contains the organization list, a review of the work and publications of the station, meteorological observations noted on page 207, and a financial statement for the fiscal year ended June 30, 1926. The experimental work reported is for the most part abstracted elsewhere in this issue.

Bimonthly Bulletin of the Ohio Agricultural Experiment Station [November–December, 1926] (*Ohio Sta. Bimo. Bul., 11 (1926), No. 6, pp. 209–256, figs. 17*).—This number contains, in addition to several articles abstracted elsewhere in this issue, the following: Meat Meal Versus Meat Scraps for Egg Production, by D. C. Kennard, and Storage of Potatoes.

NOTES

Arizona University and Station.—A wool laboratory has been completed for use in the animal husbandry work. This will enable the station to make careful studies of wool and mohair produced in Arizona in relation to quality, strength, shrinkage, and scouring.

Dr. O. C. Magistad, soil chemist for a commercial fruit company in Honduras, has been appointed associate professor of agricultural chemistry and associate chemist in the station, beginning March 1.

Cornell University.—A gift of $130,000 for the endowment of a research professorship in forest soils has been made by the Charles Lathrop Pack Forestry Trust, together with additional funds for operating expenses in the advanced line of investigation to be undertaken. The chair will be named for Mr. Pack, founder of the trust and the maker of other large gifts for the promotion and support of education in forestry. Among these are the Charles Lathrop Pack Demonstration Forest, a 2,500-acre tract of white pine land on the main Adirondack highway near Lake George, and land or endowments to the New York State College of Forestry, the Yale Forest School, and the University of Washington.

The research work contemplated will be done in the College of Agriculture, and it is hoped to select its head in the near future. The proposed line of investigation is a new development in forest research in this country. Although in the northeastern hardwood area, extending over the Middle Atlantic States and as far west as Indiana and Illinois, the question of proper forest care and operation depends very largely upon a study of soil conditions, practically no data on forest soils are at present available. The attempt will be made to coordinate studies in several fields of science, applying what is learned to the special soil problems involved in growing healthy forests. As the announcement states, "this research will necessarily deal with the chemistry and biology of soils. It will naturally have intimate relation with the field of heredity in tree growth, particularly as it should help to solve problems of adapting certain varieties of trees to given soils. And it will similarly have a bearing on the field of plant pathology, because of the relation that soil conditions bear to diseases of trees."

International Congress of Agriculture.—The thirteenth congress is scheduled to meet at Rome from May 23 to 28. Its program will be divided into six sections, termed, respectively, international conference of agricultural associations, which will consider the position of agriculture and the work of agricultural associations; agricultural cultivation and industry, which will discuss the cultivation of cereals from an economic and social point of view; zootechny, which will deal with the problem of the world production of meat and milk from an economic and social viewpoint; training and cooperation in the agricultural industry, which will consider the scientific organization of agricultural work; agricultural geology and climatology; and the women's section, which will deal with women's organizations in rural districts, domestic economy, training for rural women, and the development of rural life.

EXPERIMENT STATION RECORD

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When presenting in these columns an interpretation of the successive acts making appropriations for the support of the Federal Department of Agriculture, reference has often been made to the general interest which seems to exist in the prospective financial resources and lines of development of the Department and the difficulties which are commonly encountered in attempting to utilize the appropriation acts as a basis of information without considerable explanation. Although the general form of this legislation has become relatively stabilized, seldom is the act for one year directly comparable with that of another because of the omission or inclusion of numerous items. An even more deceptive factor is the fact that some of the Department's funds come from other sources. Among these are the so-called " permanent " and " deficiency " appropriations and the variable but often important special appropriations provided in other legislation.

All of these complications enter into a comparison of the latest of these acts, covering the fiscal year ending June 30, 1928, with its immediate predecessor. The total amount available under the new act will be $128,511,739, or including the permanent appropriations of $11,351,250, which are continued unchanged, $139,862,989. This is an apparent increase of $227,166. However, it fails to take into account a special appropriation of $10,000,000 for combating the European corn borer and certain deficiency items approved February 28, 1927, aggregating $3,808,000 and in part available for the work of both fiscal years. Taken collectively these allotments swell the total appropriations to the Department to $153,670,989, by far the largest amount ever granted.

From the standpoint of agriculture, the real situation is further obscured by the large proportion of these appropriations which is devoted to road construction. The total for this purpose carried in the act is $77,500,000, with $1,400,000 more in the First Deficiency Act, or slightly more than half of the total funds accredited to the Department. Viewed from another angle, as the roads funds in the act represent a decrease of $2,500,000 from the previous act, there is a corresponding increase in the funds available for other purposes.

Including the large emergency corn borer appropriation and the deficiency allotment of $2,155,000 for fighting forest fires during the fiscal year 1927, the net increase becomes $14,380,166, or slightly less than 19 per cent.

This increase, which is perhaps the most significant figure which can be adopted for the purposes of this discussion, is for the most part concentrated in a few large items. Among these are $1,200,000 additional for the payment of indemnities to farmers in connection with tuberculosis eradication work, $1,192,000 being made immediately available; $480,000 additional for the increased payment to the States under the Purnell Act; $290,000 additional for cooperative forest fire protection; $200,120 additional in the allotment to the Bureau of Entomology for its work in the prevention of the spread of the European corn borer; $180,000 additional for the Japanese and Asiatic beetle campaign; and $100,000 additional for white pine blister rust control. There are also many smaller items of increase and some reductions.

The formulation of the new act received unusually prompt consideration by Congress, and its approval by President Coolidge on January 18, 1927, took place earlier in the session than for many years. None the less its provisions received the usual detailed scrutiny by the Bureau of the Budget, and the testimony in the hearings before the House and Senate subcommittees aggregated nearly 1,000 printed pages. In the main the recommendations of the Bureau of the Budget were adhered to, the principal deviation being the appropriation of $5,000,000 less than the recommendation for the Federal aid highway system and forest roads and trails.

Following the precedents of recent years, the act contains little general legislation, the most important innovation being a reorganization and regrouping of some of the activities of the Department. Chief among these is the establishment of a Bureau of Chemistry and Soils, which will take over on July 1, 1927, all of the research work of the Department in these two subjects. This will include the entire Bureau of Soils as at present constituted, the soil bacteriology and soil fertility investigations of the Bureau of Plant Industry, and the entire Bureau of Chemistry with the exception of those units having to do with the enforcement of the regulatory laws dealing with food and drugs, tea, and naval stores and the analytical work conducted in collaboration with other departments. These phases are to be joined with the work of the Insecticide and Fungicide Board into a regulatory unit to be known as the Food, Drug, and Insecticide Administration. The reorganization, advocated by Secretary Jardine as a logical development, will serve to differentiate more clearly the research and regulatory functions of the Depart-

ment and will concentrate closely related chemical and biochemical research into a single bureau.

Another innovation in the form of the bill needs special explanation in considering the allotments for specific undertakings of the Department. This consists in eliminating the so-called "general salaries allotments" of the several bureaus and offices and reapportioning these sums to the various projects and investigations. The practice now to be discarded was a survival from the "statutory rolls" required prior to the Classification Act of 1923 and from the standpoint of the general public was extremely confusing, since the act indicated certain amounts for specific projects while the "general salaries allotment" also was used to supplement the same projects to an indefinite degree. The change thus affords much more complete information as to the total funds actually available for the various investigations than has hitherto been obtainable from the act, but there is the disadvantage of preventing a direct comparison of the new allotments with those for the previous years. This difficulty, however, does not extend to the totals for the bureaus and need be reckoned with chiefly as the explanation of many apparent project increases.

Taking up the various branches of the Department in turn, the Office of the Secretary receives $8,874,977. This includes as its principal items the usual payments to the States of $1,440,000 under the Hatch and Adams Acts, $1,920,000 under the Purnell Act. $1,300,000 for the supplementary extension work under the Smith-Lever Act, and $1,424,000 for the Department's own cooperative extension work, but not the Smith-Lever funds themselves of $4,580,000 as these are provided for in the permanent appropriations. There is an apparent increase of $308,157, but since the Department Library, hitherto appropriated for separately, is now included as a unit of the Office of the Secretary the net increase is really $223,977. This sum is the resultant of a number of increases and decreases, the former including as its principal item the additional $480,000 under the Purnell Act, while the latter is due in part to reductions of $200,000 in the Department's allotment of $938,000 for printing and binding by the omission of the special appropriation for reprinting the publications of the Department dealing with the diseases of horses and cattle and $35,000 for the purchase, recently completed, of over 1,000 acres of land at Beltsville, Md. There is also a net reduction of $25,000 in the funds for rent of buildings in the District of Columbia, this resulting from a purchase for the Department in October, 1926, of a four-story brick building erected for its use and acquired under the comprehensive public buildings program initiated last year.

The funds available for the Office of Experiment Stations are continued at $124,566, of which $117,140 may be expended for salaries in the District of Columbia. The respective allotments for the maintenance of the experiment stations in Alaska, Hawaii, and Porto Rico of $76,240, $54,940, and $56,460 are unchanged, while the Guam and Virgin Islands Stations each receive $25,000. An increase of $840 for the Guam Station will provide for the continuation of entomological studies previously undertaken, and one of $2,820 for the Virgin Islands will enable that station to continue demonstration work recently begun on St. Thomas and St. John.

The Weather Bureau is granted $2,646,073, a net increase of $1,993. The funds for investigating atmospheric phenomena from the special point of view of aviation were enlarged by $44,600, making available for the purpose $241,500, and those for the frost warning service by $4,000, but these are offset by the omission of $38,000 previously appropriated to erect a building at East Lansing, Mich., now completed and a reduction of $8,607 in certain administrative funds.

The new appropriations for the Bureau of Animal Industry aggregate $10,671,470, and these are as usual supplemented by the $3,000,000 permanent appropriation for meat inspection. The net increase from $4,653,000 to $5,964,000 in the funds for tuberculosis eradication already referred to is the principal change. Large appropriations estimated at over $11,000,000 are also expected to be available from the States under the cooperative understanding in effect for several years, forecasting a campaign of much activity. It is of interest to note that during the past year over 8,000,000 cattle were tested, of which a little over 3 per cent were reactors, and that the number of accredited cattle was in excess of 1,500,000, while over 10,500,000 cattle had passed one of the two clean tests required. The phraseology of the act is modified to include work with paratuberculosis and to permit the payment of indemnities to owners of animals which after condemnation for tuberculosis have died prior to slaughter from natural or other causes.

The allotments for combating other animal diseases were reduced. For the cattle tick campaign $24,450 less is given, the new appropriation aggregating $712,390. During the calendar year 1925, the last for which data are available, eradication was completed in 72 additional counties, making a total of 601 of the 984 counties originally infested. The hog cholera campaign receives $451,820 (a reduction of $3,263) and that against dourine $26,970 (a reduction of $5,000), while the emergency appropriation for the eradication of foot-and-mouth and other contagious diseases is decreased from $5,000 to the nominal sum of $100. The last outbreak of foot-and-

mouth disease was suppressed June 10, 1926, and it is estimated that on July 1, 1927, a balance will remain from the appropriation for this purpose of over $2,000,000. Permission is granted in the new act to utilize $10,000 from this balance in an attempt to control or eradicate European fowl pest and similar diseases of poultry. An increase of $10,000 in the allotment for the bureau's inspection and quarantine service will enable a more comprehensive examination of animals imported over the Mexican border and the enforcement of new regulations governing imports in secondhand bags, suspected of being potential carriers of various diseases.

The animal husbandry allotment is increased by $27,420 to a total of $441,670. A portion of this increase is for the livestock experimental station at Miles City, Mont., $7,500 for studies of the factors affecting the quality and color of meat, and the remainder to extend the poultry feeding and breeding experiments at Glendale, Ariz.

The Bureau of Dairy Industry receives $499,734, an increase of $4,640. There is also carried elsewhere in the act an increase of $2,000 for the experimental work at Huntley, Mont., and an initial appropriation of $25,000 toward the immediate establishment of the dairying and livestock experiment station in connection with the Great Plains Experiment Station at Mandan, N. Dak., authorized by an act approved July 3, 1926.

The total for the Bureau of Plant Industry is $3,945,425, an increase from $3,801,015, and with a considerable number of relatively small readjustments of funds. The additional allotments include $20,745 for forest pathological studies, $11,905 of which is for work with blight-resistant chestnuts; $100,000 for the white pine blister rust campaign, previously noted, to provide for an extension in the Northwest; $10,000 for the development of desirable disease-resistant varieties of sugar cane; $5,000 for a study of the commercial possibilities of levulose production from Jerusalem artichokes; $17,000 for cotton and truck diseases, of which $7,500 is made available for studies of the root rot of cotton and the remainder is for studies of curly top of truck crops; $5,000 for fruit improvement; and $2,000 for forage crop investigations. On the other hand, there are decreases of $1,000 for the pathological laboratory, $3,630 for citrus canker eradication, now completed except for small plantings in Louisiana and Texas, and $1,412 for the studies of drug and miscellaneous plants.

The Forest Service receives $8,608,570, together with $1,000,000 for the acquisition of additional land at the headwaters of navigable streams, $75,000 for the cooperative distribution of planting stock, $1,000,000 (an increase of $290,000) for cooperative forest fire protection and suppression, $60,000 (an increase of $10,000) for assistance to farm owners on forest problems, and $6,500,000 (an increase

of $1,500,000) for the construction of forest roads and trails. These various appropriations, together with $3,771,250 from the permanent appropriations, make a total of $21,014,820 available for forestry work. This expenditure will be offset to a considerable degree, as usual, by the receipts from the national forests, which in 1926 amounted to $5,155,661.02.

An increase of $65,000 for silvical investigations will be utilized mainly in establishing two additional forest experiment stations authorized July 3, 1926. One of these stations will be so located as to serve the Mississippi and Ohio Valleys and the other those of Pennsylvania and neighboring States. These stations will bring to eleven the number of regional stations now in operation.

The Forest Service funds for the administration of the national forests, which now include 158,759,000 acres and are valued at over $1,500,000,000, were increased by $130,027. Of this amount $77,285 is to provide additional fire protection and $40,717 is for the administration of commercial timber sales, while a new item of $3,000 is for the purchase and maintenance at the Wichita National Forest in Oklahoma of a herd of long-horned or Spanish cattle as a means of preserving this historic breed against complete extinction. There is also an increase of $9,736 in the allotment of $500,000 for the forest products investigations.

The new Bureau of Chemistry and Soils receives $1,115,005, an increase of $38,005 over the comparable lines of work for the previous year. The allotment for general chemistry studies is increased from $191,347 to $195,947 and that for soil fertility studies from $66,200 to $71,200. An increase of $10,200 in the funds for investigations of plant dust explosions and fires is provided for a study of farm fires, the losses from which during the past fiscal year are estimated at $150,000,000 and 3,500 lives. On the other hand, the insecticide and fungicide investigations are decreased by $580, and the soil survey, which has now covered about 35 per cent of the agricultural lands, by $3,220.

The Bureau of Entomology receives an increase from $2,640,168 to $3,078,265. This is, of course, independent of the emergency $10,000,000 European corn borer appropriation already referred to, but includes an increase from $485,000 to $685,120 for the bureau's research on this insect. Of this amount $50,000 is made immediately available, and in the discretion of the Secretary of Agriculture the expediture of $300,000 may be made only when an equal amount becomes available from other sources. For the Japanese beetle control an increase from $285,000 to $465,000 is provided, while for the gipsy and brown-tail moth campaign the previous allotment of $670,000 is continued unchanged. The remaining increases are those of $11,980 for combating deciduous fruit insects, $20,400 for insects

affecting southern field crops, especially the cotton hopper; $2,835 for insects affecting tropical and subtropical plants; and $26,575 for miscellaneous insects.

For the Bureau of Biological Survey there is an increase from $987,365 to $1,035,020. Of this increase $22,000 is for the maintenance of mammal and bird reservations, $15,000 for the studies of North American birds and other animals (to be devoted to investigations of the breeding and diseases of fur-bearing and meat-producing animals), $10,000 for reindeer breeding and protection in Alaska, and $5,000 toward the acquisition of additional areas of land and water for the Upper Mississippi River Wild Life and Fish Refuge. There is also a reduction of $4,345 in the allotment of $158,000 for the protection of migratory birds.

The total for the Bureau of Agricultural Economics, $5,016,251, represents a net increase of $119,854. Of this sum $50,000 is to extend the cotton statistics to include estimates of the amount of the various grades produced, while $11,245 additional for the market inspection of perishable farm produce will provide two more inspectors for fruits and vegetables, one for eggs, and one for meats, in response to a steadily growing demand for this service. Of somewhat similar nature are the increases of $11,060 for the enforcement of the U. S. Grain Standards Act, $24,940 for the U. S. Warehouse Act, and $13,470 for the Grain Futures Act. In consequence of the passage on July 2, 1926, of an act creating a division of cooperative marketing in the bureau, the funds available for this work have been increased from $163,440 to $220,000. On the other hand, there are reductions from $617,768 to $596,780 in the funds for studies of marketing farm products, from $6,290 to $3,000 in those for the completion of the wool work of the War Industries Board, and from $440,000 to $420,000 in those for the enforcement of the Packers and Stockyards Act.

The enforcement of the Plant Quarantine Act by the Federal Horticultural Board is strengthened by an allotment of $25,000 additional for port inspection service, while for the Thurberia weevil quarantine $32,800 is added as a new item. In the campaigns for the eradication of the pink bollworm and the Parlatoria date scale reductions are made of $50,000 and $2,760, respectively.

The work of the remaining branches of the Department is continued substantially on the present basis. The Bureau of Home Economics again receives $127,244, and in addition to its large appropriations for road construction already discussed the Bureau of Public Roads is allotted $457,170, a decrease of $6,509. The newly established Food, Drug, and Insecticide Administration is granted as its initial appropriation $1,311,385. Its allotment for the enforcement of the Naval Stores Act is increased by $10,000,

while those for the tea importation and insecticide acts are decreased by $2,690 and $795, respectively.

The closing days of the final session of the Sixty-ninth Congress were noteworthy for the passage of a number of other acts enlarging the duties and responsibilities of the Department. In most cases appropriations to carry out this legislation were authorized but the failure of the second deficiency appropriation bill to receive consideration in the Senate prevented the actual appropriation of the funds. Among these measures were an act to prevent the destruction or dumping without sufficient cause of farm produce received in interstate commerce by commission merchants, to enforce which during the fiscal year 1927 the Secretary of Agriculture was to have been given $25,000; another act regulates the importation of milk and cream and carries an authorization of $50,000 per annum; a third measure authorizes the Department to collect and publish additional statistics as to the grade and staple length of cotton; and a fourth amended the Cotton Futures Act to facilitate the adjustment of differences above and below "middling" in future contracts. Other appropriations authorized but not completed were $100,000 to enable the Department to construct and maintain highways in the Virgin Islands, $50,000 for cooperation with the South Carolina Experiment Station in investigating the dairying and livestock industries and developing agriculture in the Sand Hill region, and $8,600,000 for loans by the Department to farmers in the drought and storm stricken areas of the Northwestern and cotton States for the purchase of seed grain, feed, and fertilizer.

Legislation was also passed, authorizing acceptance by the Secretary of a gift of about 1,760 acres of land in Wyoming, to be known as the Izaak Walton League Addition to the winter elk refuge maintained by the Biological Survey at Jackson Hole, and establishing a national arboretum, at a cost for land of $300,000, to be located within or adjacent to the District of Columbia.

Taken as a whole the appropriation act and the various supplementary measures present few spectacular innovations other than the European corn borer campaign, which is doubtless the largest operation of the sort ever to be attempted. There are, however, many smaller increases looking toward the more adequate control of specific pests and diseases and similar undertakings, and but few decreases in any direction. The importance of an uninterrupted development of existing projects is quite clearly recognized throughout the act, and even the failure of the second deficiency act, although postponing the operation of the various measures just referred to, will cause much less inconvenience than in the case of several other branches of the Government. Under the general conditions the outlook for the new fiscal year is very promising.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

A half-century of chemistry in America, 1876–1926, edited by C. A. BROWNE (*Jour. Amer. Chem. Soc., 48 (1926), No. 8–A, pp. XIV+254, figs. 61*).—This historical review commemorating the fiftieth anniversary of the founding of the American Chemical Society consists of two parts, the first dealing with the origins and developments of the American Chemical Society and the second with reviews of progress in various branches of chemistry in America. Of particular interest in the second part are the reviews of The Chemistry of Physiology and Nutrition, by G. Lusk, and Agricultural Chemistry, by Browne.

Recent advances in biochemistry, J. PRYDE (*London: J. & A. Churchill, 1926, pp. VIII+348, pls. 4, figs. 34*).—Recent progress in various fields of biological chemistry is summarized in 11 chapters dealing, respectively, with aspects of protein catabolism, colloids and the physical chemistry of proteins, the nucleoproteins, the carbohydrates, the biochemistry of the fats, the biochemistry of phosphorus compounds, the rôle of sulfur in biochemistry, the vitamins, hemoglobin and related natural pigments, the chemical basis of specific immunological reactions, and chemotherapy. A list of literature references is given at the end of each chapter.

Practical organic and bio-chemistry, R. H. A. PLIMMER (*London and New York: Longmans, Green & Co., 1926, new ed., pp. X+568, pl. 1, figs. 67*).—In the present edition of this volume, originally compiled as a practical handbook for medical students (E. S. R., 39, p. 607), the theoretical part of organic chemistry has been enlarged in order that the book might serve as a text as well as a laboratory manual. Additional material has been added to the section on physiological chemistry, but in spite of these additions the book is reduced somewhat in size through the omission of advanced portions considered nonessential in a general course.

A text-book of organic chemistry, A. F. HOLLEMAN, edited by A. J. WALKER and O. E. MOTT (*New York: John Wiley & Sons; London: Chapman & Hall, 1925, 6. ed., rewritten, pp. XX+581, figs. 77*).—In the present revision of this well-known textbook (E. S. R., 44, p. 409) still more space has been allotted to the applications in organic chemistry of various physicochemical methods. An account has been added of the work of Irvine and his collaborators on the constitution of the dioses, and in connection with dyestuffs a review of the relationship between constitution and color has been introduced.

Reports of the progress of applied chemistry, 1923, [1924, and 1925], edited by T. F. BURTON (*Soc. Chem. Indus. [London], Ann. Rpts. Prog. Appl. Chem., 8 (1923), pp. 618, fig. 1; 9 (1924), pp. 700, figs. 2; 10 (1925), pp. 723*).—These volumes continue for 1923–1925 the survey of progress in various fields of applied chemistry (E. S. R., 49, p. 608).

Chemical synonyms and trade names, W. GARDNER (*London: Crosby Lockwood & Son, 1925, 2. ed., enl., pp. VI+271+56*).—An appendix containing an additional 2,700 definitions has been added to the original edition of this reference work (E. S. R., 52, p. 108).

Manual for the dairy chemist, F. LABARRE (*Manuel du Chimiste de Laiterie. Gauthier-Villars & Co., 1926, pp. [3]+168*).—A laboratory manual on the analysis of milk and detection of various adulterants and the analysis of butter, cheese, condensed milk, dried milk, and casein. Necessary tables and French laws and official methods are included.

The fats, J. B. LEATHES and H. S. RAPER (*London and New York: Longmans, Green & Co., 1925, 2. ed., [enl.], pp. VII+242, fig. 1*).—The most important change in the present revision of this monograph (E. S. R., 23, p. 704) has been the extension of the section on the physiology of fats from about 20 pages to seven chapters.

Fatty oils as substitutes for ethyl alcohol in citrus flavors, H. A. SCHUETTE and B. P. DOMOGALLA (*Indus. and Engin. Chem., 18 (1926), No. 12, pp. 1254–1257, figs. 2*).—This study of the suitability of various fatty oils, including corn, cottonseed, olive, and peanut, for solvents of lemon and orange oils to be used as flavoring agents includes the effect of the solvent upon the rotation of the essential oil and the keeping qualities of the solution.

When used soon after preparation, the oils proved satisfactory as judged by the flavor of the baked products in which they had been used, but on standing the acidity of the oils developed to such a degree that in less than a year the taste was so objectionable that the oils could not be utilized. With age and increasing acidity there was a reduction in the optical rotation of the essential oils indicating decomposition.

The phytosterols of corn oil, R. J. ANDERSON and R. L. SHRINER (*Jour. Amer. Chem. Soc., 48 (1926), No. 11, pp. 2976–2986*).—In addition to the results given in a progress report of this study (E. S. R., 54, p. 502), further evidence is given of the presence in corn oil of a mixture of at least three isomeric sterols corresponding in composition to sitosterol, $C_{27}H_{45}OH$. The names α-, β-, and γ- sitosterols are proposed for these isomers of which only one, the γ form, has as yet been obtained in a pure condition, crystallizing in colorless plates melting at 145–146° C.

The phytosterols of rice bran fat, F. P. NABENHAUER and R. J. ANDERSON (*Jour. Amer. Chem. Soc., 48 (1926), No. 11, pp. 2972–2976*).—Essentially noted from a progress report (E. S. R., 54, p. 502).

The phytosterols of wheat germ oil, R. J. ANDERSON, R. L. SHRINER, and G. O. BURR (*Jour. Amer. Chem. Soc., 48 (1926), No. 11, pp. 2987–2996*).—The sterols of wheat germ were found to consist of dihydrositosterol and at least three sterols isomeric with sitosterol and apparently identical with those isolated from corn oil as noted above.

The viscosity of pectin sols, A. OHN (*Indus. and Engin. Chem., 18 (1926), No. 12, pp. 1295–1298, fig. 1*).—A pectin preparation made from a distilled water extract of orange albedo by alcohol precipitation was used to determine the relative viscosity of sols prepared from varying proportions of the pectin, citric acid, cane sugar, and distilled water. The viscosity measurements were made with the Stormer viscosimeter at varying temperatures from 60 to 103° C. The results obtained are summarized as follows:

"The optimum ratio for a good jelly using this pectin preparation is 0.40 gm. pectin and 62.5 gm. sugar per 100 cc. at pH 2.60. The relative viscosity of this sol at 103° is 0.560. At 100° a pectin-acid-sugar sol having a viscosity greater than 0.556 relative to a glycerol standard at 60° will jell. When the amounts of acid, pectin, and sugar are sufficient to cause jelly formation, sudden increases in the relative viscosity occur below 80°. The temperature at which the sol shows a sudden increase of the relative viscosity may be called its jellying point. Thus measurements of the relative viscosity may be used as an indication of jellying power. Within certain limits the surface tension

decreases as the relative viscosity of the sol increases, depending apparently upon the lowering of the pH."

Acetyl groups in pectin, E. K. Nelson (*Jour. Amer. Chem. Soc., 48 (1926), No. 11, pp. 2945, 2946*).—Determinations of the content of acetyl groups in various pectins prepared in the laboratory by the method of Ehrlich and Sommerfeld (E. S. R., 55, p. 407) are reported.

Lemon pectin yielded only 0.37 per cent of acid calculated as acetic after deducting the formic acid formed in the distillation, apple pectin 0.45, and tomato pectin 0.79 per cent, while sugar-beet pectin yielded 6 per cent. It is concluded that the acetyl group is not an essential constituent of pectins in general. Its presence in root pectins, such as beet pectin, is attributed to the presence in the original material of lignin, lignocellulose, or cell materials containing acetyl groups.

A contribution to the chemistry of grape pigments.—IV, The anthocyans in Isabella grapes, R. J. Anderson and F. P. Nabenhauer (*Jour. Amer. Chem. Soc., 48 (1926), No. 11, pp. 2997–3003*).—This continuation of the chemical study of the pigments of grapes (E. S. R., 52, p. 803) has been noted briefly from a progress report (E. S. R., 54, p. 503).

The antiscorbutic fraction of lemon juice, IV, C. G. Daubney and S. S. Zilva (*Biochem. Jour., 20 (1926), No. 5, pp. 1055–1059*).—Continuing the investigation of the chemical nature of vitamin C (E. S. R., 55, p. 309), the authors have determined the ash content of six batches of lemon juice and of the purest fraction as yet obtained from it, with the following results: 0.1503 and 0.00262, 0.2124 and 0.00069, 0.1732 and 0.00252, 0.2034 and 0.00790, 0.1896 and 0.00601, and 0.2084 and 0.002742 per cent for the original juice and purified fractions, respectively.

The ash of the concentrate was examined for nickel, cobalt, boron, iodine, and phosphorus, with negative results for the first three. Iodine was present in amounts corresponding to from 0.1 to 0.2 mg. per liter, but was excluded from being a part of the antiscorbutic substance itself, since it did not diffuse through collodion membranes soaked in 95 per cent alcohol through which the active material passed readily. As determined by the Neumann method, phosphorus was present in all of the samples to the extent of from 0.0005 to 0.0009 per cent.

Non-volatile constituents of the cotton plant, F. B. Power and V. K. Chesnut (*Jour. Amer. Chem. Soc., 48 (1926), No. 10, pp. 2721–2737*).—The investigation previously noted (E. S. R., 54, p. 803) has been extended to include the nonvolatile constituents of the branches of the cotton plant stripped from the coarse, woody stems and with all bolls removed. From this material, after extraction with alcohol and distillation with steam, a dark-colored aqueous liquid and a black, oily resin were obtained. From the former were isolated considerable amounts of potassium nitrate and potassium chloride, quercetin, betaine, choline, succinic acid, and a small amount of salicylic acid, together with a nonidentified crystalline acid melting at 105 to 106° C. and a neutral crystalline substance melting at 140 to 143°. The liquid from which these substances have been obtained reduced Fehling's solution strongly, thus indicating the presence of a considerable proportion of a reducing sugar.

From the oily resin, amounting to 3.134 per cent of the dry material, the following substances were obtained: A phytosterol, $C_{27}H_{46}O.H_2O$ (m. p., 135°); a phytosterolin (phytosterol glucoside), $C_{33}H_{56}O_6$ (m. p., 218–223°), which yielded on hydrolysis a phytosterol (m. p., 135°) and a sugar which undoubtedly was glucose; pentatriacontane, $C_{35}H_{72}$ (m. p., 75°); palmitic acid; an acid of phenolic character (m. p., 188–189°); a mixture of volatile acids, consisting apparently of butyric, valeric, and caproic acids, the first two predominating;

and a small amount of a phenolic substance, which could not be identified with any of the phenols which have thus far been examined spectrophotometrically. By the distillation in a vacuum of a portion of the unsaponifiable material a mixture of terpenes was obtained from which the following substances were isolated: Dipentene, $C_{10}H_{16}$ (tetrabromide, m. p., 122–123°); an oxygenated compound (b. p., 200–220) which appears to possess the formula $C_8H_{16}O$; an optically active, dicyclic sesquiterpene, $C_{15}H_{24}$; and a product (b. p., 300–350°) which evidently consisted of diterpenes, $C_{20}H_{32}$.

A modification of the deflection balance for use in biochemical laboratories, J. W. Trevan (*Biochem. Jour., 20 (1926), No. 2, pp. 419–422, fig. 1*).—"A cheap and simple form of balance is described, the action of which depends on the bending of a steel wire. By its means 1 to 30 mg. can be weighed to ±0.01 mg. in 30 seconds. By using a series of wires of different thicknesses on the same instrument, the replacement of the wire by another taking only a few seconds, any range of weights from 1 mg. to 1 gm. can be weighed with an accuracy of ±1 in 10,000."

Indicators: Their use in quantitative analysis and in the colorimetric determination of hydrogen-ion concentration, I. M. Kolthoff, trans. by N. H. Furman (*New York: John Wiley & Sons; London: Chapman & Hall, 1926, pp. XII+269, pl. 1, figs. 23*).—This translation is based upon the second German edition, but contains a new chapter on amphoteric compounds and numerous additions distributed through the text.

A rapid colorimetric method of estimating pentoses, R. A. McCance (*Biochem. Jour., 20 (1926), No. 5, pp. 1111–1113*).—In the method described, varying amounts of the pentose material to be tested are heated for two hours in the water bath with concentrated hydrochloric acid in test tubes fitted with glass tubes to act as condensers. After cooling, the furfural formed is shaken out with benzene and the color developed with a benzidine reagent prepared by dissolving 0.5 gm. of benzidine in 100 cc. of equal parts of absolute alcohol and glacial acetic acid. A deep violet color is said to develop in about 15 minutes and to persist for nearly two hours. Standards for comparison are prepared from arabinose treated in the same way. The method, while having definite limitations, is recommended for certain purposes, particularly the examination of the urine, on account of its simplicity and rapidity.

Fat content of breads and cereals, G. A. Cormack (*Biochem. Jour., 20 (1926), No. 5, pp. 1052–1054*).—A comparison is reported of the ether-soluble material in flours prepared from wheat, oats, barley, and soy beans as determined by Soxhlet extraction before and after pepsin digestion of the flour.

From two to three times as much fat was removed from the flour after peptic digestion as before. Repeated extraction of the flour was also found to increase considerably the amount of fat obtained, and it is concluded that the fat content usually reported for flour and bread is too low. The values obtained for various types of bread before and after digestion are Scotch white bread 0.29 and 0.93, English white bread 0.27 and 0.61, Scotch pan loaf 0.96 and 1.6, and Scotch brown bread 1.4 and 2.8 per cent, respectively.

The estimation of iodine in foodstuffs and body fluids, I. Leitch and J. McA. Henderson (*Biochem. Jour., 20 (1926), No. 5, pp. 1003–1007, fig. 1*).—The Fellenberg method of determining iodine in biological materials (E. S. R., 53, p. 201) has been modified by the elimination of the colorimetric, and slight changes in the titrimetric, determinations. Nickel crucibles are used in place of iron for the preliminary ashing of the material. Potassium nitrite is omitted, and 2 N sulfuric acid used for the acidification and bromine water in place of chlorine water for the liberation of the iodine. The method is described in full, with data on its accuracy. It is estimated that the error is

about ±10 per cent when iodine is present in such minute quantities as from 0.5γ to 2γ.

The search for colour reactions of vitamin "A," T. T. COCKING and E. A. PRICE (*Pharm. Jour. and Pharm.* [*London*], *4. ser., 63* (*1926*), *No. 3275, pp. 175–178*).—Further experience in the use of antimony trichloride dissolved in chloroform as a color reagent for vitamin A (E. S. R., 56, p. 10) is reported, substantiating the earlier conclusions that this reagent is superior to others which have been recommended for this test. The advantages of the antimony trichloride reagent are thought to be that the reaction is not interfered with by traces of water or alcohol in the chloroform, that a fully saturated solution is not essential, that the blue color produced is more permanent and intense than the colors given by any other reagents tested, and that the reagent is relatively innocuous and does not lose its activity for several months if kept in a stoppered bottle.

Data are tabulated on the original color as determined by the Lovibond tintometer and the color developed by the antimony trichloride reagent in 17 samples of Norwegian cod-liver oil and 6 of Newfoundland oil. The percentages of unsaponifiable matter in some of the oils were also determined. As judged by these data, the color of the oil itself and the amount of unsaponifiable matter present are not criteria of the vitamin A content, the activity of cod-liver oils with respect to vitamin A may vary as much as 8 to 1, and the Newfoundland oils examined have on an average a higher content of vitamin A than the Norwegian oils.

An alphabetical summary is given of the various reagents which have been used for the color test, with the color yielded, and the advantages and disadvantages in the test.

The estimation of calcium in blood serum, J. W. TREVAN and H. W. BAINBRIDGE (*Biochem. Jour., 20* (*1926*), *No. 2, pp. 423–426, fig. 1*).—A method of determining calcium in blood serum is described in which the calcium is precipitated as oxalate as in the method of Kramer and Tisdall (E. S. R., 46, p. 203), washed with saturated ammonium oxalate in place of water, and then converted into calcium carbonate by heating in the centrifuge tube in which it is separated and washed. The calcium carbonate is finally titrated with N/100 phosphoric acid, H_3PO_4, using bromophenol blue as indicator. By the use of a special micrometer syringe devised by the senior author only 1 cc. of serum is required, and smaller quantities down to 0.1 cc. are said to give results sufficiently accurate for most purposes.

The analysis of pigments, paints, and varnishes, J. J. FOX and T. H. BOWLES (*London: Ernest Benn, 1927, pp. X+11—179, figs. 9*).—This is one of the oil and color chemistry monographs edited by R. S. Morrell.

Furfural steps into industry, D. H. KILLEFFER (*Indus. and Engin. Chem., 18* (*1926*), *No. 12, pp. 1217–1219, figs. 2*).—A description is given of the commercial manufacture of furfural from oat hulls by a method similar to that developed at the U. S. Department of Agriculture for its production from corncobs (E. S. R., 51, p. 809). A flow sheet for furfural production from the original oats to the technical product is included. It is noted that before 1922 furfural was obtainable with difficulty at prices varying from $6.50 to $30 per pound, while in May, 1926, the price was 15 cts. per pound. Various uses of furfural are listed.

METEOROLOGY

Monthly Weather Review, [September–October, 1926] (*U. S. Mo. Weather Rev., 54* (*1926*), *Nos. 9, pp. 367–408, pls. 15, figs. 9; 10, pp. 409–452, pls. 14, figs. 4*).—In addition to detailed summaries of meteorological and climatological data and weather conditions for September and October, 1926, and

bibliographical information, notes, abstracts, and reviews, these numbers contain the following contributions:

No. 9.—Weather and Sugar Cane in Louisiana (illus.), by W. F. McDonald (abs.) (see below); the Tropical Storm of August 25–26, 1926, in Southern Louisiana, by R. A. Dyke; Persistence of Weather Types in the Hawaiian Islands (illus.), by E. F. Loveridge (see below); Forecasting Precipitation from Local Data (illus.), by C. L. Ray (see below); Wind as Motive Power for Electrical Generators (illus.), by H. G. Carter (see p. 315); Climatological Data for Andagoya, Republic of Colombia, South America, by P. C. Day; C. E. P. Brooks on Variations of Pressure from Month to Month in the Region of the British Isles, by A. J. Henry; Part 2 of Gregg's Aerological Survey of the United States; Results of Observations by Means of Pilot Balloons, by B. M. Varney; and Solarimeters and Solarigraphs (illus.), by L. Gorczyński (see below).

No. 10.—The West Indian Hurricanes of September 14–22, 1926 (illus.), by C. L. Mitchell; An Interpretation of the Wind Velocity Record at Miami Beach, Fla., September 17–18, 1926, by B. C. Kadel; Destructive Gust at Jupiter, Fla., Following the Miami Hurricane, by H. B. Boyer; The Hurricane at Turks Island, September 16, 1926, by G. Goodwin; A. Ångström on "Radiation and Climate," by H. H. Kimball; Broadcasting Weather Maps by Radio (illus.), by B. F. Dashiell; Horizontal Ground Day Visibility at Ellendale, N. Dak., by L. A. Warren; A Graphic and Tabular Aid to Interpreting Correlation Coefficients (illus.), by J. F. Voorhees; Substances in Rains and Snows, by H. Ribble and P. Bowman (see p. 321); and Climate and Weather at Kerguelen Island, by B. M. Varney.

Solarimeters and solarigraphs, L. GORCZYŃSKI (*U. S. Mo. Weather Rev., 54 (1926), No. 9, pp. 381–384, pl. 1, fig. 1*).—Simple instruments for direct readings of solar radiation intensity from sun and sky are described.

Forecasting precipitation from local data, C. L. RAY (*U. S. Mo. Weather Rev., 54 (1926), No. 9, pp. 372–374, figs. 2*).—A statistical and graphic study of the probability of rain following different pressure heights, wind directions, pressure changes, and the several combinations of these factors are presented, but "do not show a sufficiently high average of probability to serve . . . as an aid in forecasting."

Persistence of weather types in the Hawaiian Islands, E. F. LOVERIDGE (*U. S. Mo. Weather Rev., 54 (1926), No. 9, pp. 370–372 fig. 1*).—The study reported in this article shows a systematic and persistent tendency in weather variations in the Hawaiian Islands greater than has been observed at places in higher latitudes. Temperatures show a remarkable tendency to persist. In case of rainfall, atmospheric pressure, and wind velocity the persistence is less but still clearly apparent. It is suggested that the fact that wet and dry weather tend to persist in summer might be of some value in long-range forecasting.

Weather and sugar cane in Louisiana, W. F. MCDONALD (*U. S. Mo. Weather Rev., 54 (1926), No. 9, pp. 367–369, fig. 1*).—This is a summary of a much fuller discussion of the subject previously noted (E. S. R., 55, p. 715).

There was found to be a linear correlation of +0.53 between sugar yield and the preceding March temperature, of −0.51 between the sugar yield and the preceding January rainfall, and of −0.54 between sugar yield and the August rainfall. A correlation coefficient of +0.50 between the molasses-sugar ratio and November sunshine (at New Orleans) is taken to indicate a large influence of sunshine on the ripening processes, and this appears to be in accord with general observation. The high correlations between seasonal rainfall and sugar yield in Louisiana as compared with those of tropical sugar-

producing countries indicate that "those years or terms of years when Louisiana rainfall most closely approximated the seasonal type of the Tropics, with accentuation of wet and dry seasons, produced the best yields. In Louisian increased rainfall during spring until June, and rainfall below normal from August through harvest, produces such an accentuation and increases yields, whereas years or periods of more uniformly wet character, or with the seasonal type reversed, reduce yields." "It seems reasonable to suppose that the evolutionary responses of cane, a plant of tropical origin, must be closely bound up with the rainfall regimen, seasonally the most variable climatic feature of its native habitat."

Wind as motive power for electrical generators, H. G. CARTER (*U. S. Mo. Weather Rev., 54 (1926), No. 9, pp. 374–376, figs. 4*).—A study at Lincoln, Nebr., of wind velocity and force leads to the conclusion that "while the data presented may not prove the feasibility of operating electrical generators by wind power, they at least show the possibilities."

SOILS—FERTILIZERS

Biophysical and biochemical investigation of soil, J. STOKLASA and E. G. DOERELL (*Handbuch der Biophysikalischen und Biochemischen Durchforschung des Bodens. Berlin: Paul Parey, 1926, pp. XV+812, figs. 91*).—This book deals with the biophysical and biochemical investigation of soil, and especially with methods for biological study.

Simplification of mechanical analysis of soil [trans. title], L. SMOLIK (*Ann. Sci. Agron. Franç. et Étrang., 43 (1926), No. 1, pp. 29–34*).—A simplification of the Kopecky process is described.

Soil survey of Garrett County, Maryland, J. M. SNYDER ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+957–982, fig. 1, map 1*).—This survey, made in cooperation with the Maryland Geological Survey and Experiment Station, deals with the soils of an area of 427,520 acres in western Maryland. The area is composed of two physiographic divisions, the mountain section occupying approximately three-fourths of the county, and the high rolling plateau. The county is said to be well drained.

The soils are said to be all light colored and are prevailingly deficient in organic matter. There is much uniformity in texture in both the surface and subsoil throughout the area, and nearly all of the soils contain much fragmental rock. Including rough stony land, 15 soil types of 5 series are mapped, of which the Dekalb stony silt loam and gravelly silt loam cover 36 and 22.4 per cent of the area, respectively.

Soil survey of Ottawa County, Michigan, J. O. VEATCH ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+921–955, figs. 3, map 1*).—This survey, made in cooperation with the Michigan Experiment Station, deals with the soils of an area of 361,600 acres, located in the Great Lakes Plains in southwestern Michigan. The topography is characterized by nearly level plains, partly dry and partly wet and swampy, and low rounded hills, basins, and shallow valleys of glacial origin. The greater part of the area is said to be naturally sufficiently well drained for agriculture.

The soils exhibit a diversity in texture and other characteristics. The sands or light soils occupy the greatest acreage, but the loams, silt loams, and clay loams are but slightly less in the aggregate. There are only a few small areas of gravelly soils and only negligible acreages of very stony soils and heavy clay soils. Including muck and marsh, 29 soil types of 18 series are mapped, of which the Plainfield sand and the Newton loamy fine sand cover 20.9 and 10 per cent of the area, respectively.

Soil survey of the Las Vegas area, Nevada, E. J. CARPENTER and F. O. YOUNGS (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1923, pp. III+201–245, pls. 4, fig. 1, maps 2*).—This survey deals with the soils of an area of 197,120 acres situated in Clark County in southern Nevada and which embraces the greater part of the Las Vegas Valley. The greater part of the area consists of broad gently sloping alluvial fans, with a smaller flatter area in the central part of the valley.

The soils of the valley are derived mainly from limestone, with slight admixtures of materials derived from basalt and other crystalline igneous rocks. Alkali is of widespread distribution in the valley, but generally of low concentration, except in places in the lower, more poorly drained central part of the valley. Including dune sand and rough stony land, 21 soil types of 9 series are mapped, of which the Las Vegas loam, gravelly fine sandy loam, and loamy fine sand and the Gila gravelly fine sand cover 18.8, 13.5, 12.9, and 11 per cent of the area, respectively.

Soil survey of Cayuga County, New York, H. G. LEWIS ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. IV+1023–1082, pls. 4, fig. 1, map 1*).—This survey, made in cooperation with the New York State College of Agriculture, deals with the soils of an area of 449,920 acres lying near the center of the Finger Lakes region in central New York. The topography of the area varies from smooth, nearly level, gently sloping, undulating, hilly, and morainic to steep and broken. As a whole the county is well drained, although some areas need drainage.

The soils are variable in texture, color, mode of formation, and content of lime and organic matter. The most extensive soils represent partly weathered till material of varying thickness, with some residual material from the underlying geological formations. Including muck, marsh, meadow, and steep broken land, 39 soil types of 27 series are mapped, of which the Ontario loam and the Honeoye silt loam cover 18.9 and 18.3 per cent of the area, respectively.

Soil survey of Grant and Mineral Counties, West Virginia, S. W. PHILLIPS (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+985–1022, pls. 2, fig. 1, maps 2*).—This survey, made in cooperation with the West Virginia Geological Survey, deals with the soils of an area of 517,120 acres comprising two counties in the Appalachian Mountain region in eastern West Virginia. The topography varies from rolling to mountainous. The area is drained into the north branch of the Potomac River.

The soils of the area are grouped as the smoother upland soils having a rolling to hilly topography, the first bottom and second bottom soils, and the rough mountainous areas. Including rough stony land, 20 soil types of 11 series are mapped, of which the Dekalb shale loam, rough stony land, and Dekalb stony silt loam cover 33.8, 22.6, and 12.4 per cent of the area, respectively.

Terracing in Alabama, L. C. LEBRON and M. L. NICHOLS (*Ala. Polytech. Inst. Ext. Circ. 94 (1926), pp. 11, figs. 5*).—Practical information on terracing for the prevention of soil erosion under Alabama conditions is presented.

Physiologically variable behavior of moist, air-dried, and repeatedly dried soils [trans. title], V. KÁŠ (*Sborn. Českoslov. Akad. Zeměděl. (Ann. Czechoslovak Acad. Agr.), 1 (1926), No. 1, pp. 89–152, figs. 11; Ger. abs., pp. 150–152*).—Studies are reported which showed that drying or alternate wetting and drying of soil and also freezing change its physical, chemical, and biological properties. The resulting flocculation of the colloidal material and the accompanying increase in the degree of dispersity were found to improve the conditions for bacterial life in heavy soils. Air-dried sandy clay soil

showed decreased hygroscopicity and water evaporating power. Freezing had the same effect.

Drying or freezing of heavy soils rich in colloids caused a regular increase in the catalytic power, which disappeared, however, as a result of repeated wetting. Boiling or centrifuging moist soils suspended in distilled water produced the same results as drying.

Air-dried soil suspended in distilled water and boiled or centrifuged had a lower catalytic power than moist soil. An increasing addition of colloidal potassium silicate solution to sandy clay soil depressed the catalytic power. The opposite effect was obtained with ordinary sand.

The view that physical soil properties exercise no influence in liquid cultures is considered incorrect, since the filter paper used to separate the colloidal materials from their dispersion medium is not adequate for this purpose.

Nitrification was markedly depressed by both drying and freezing. Acid formation was found to be chemically irregular in dried soils, but proceeded rapidly and reached a maximum earlier and decreased more markedly than in moist soil.

Carbon dioxide formation was found to be greater in dry soils than in moist soils, especially in the early stages. Repeated drying of a humus clayey sand garden soil further increased the carbon dioxide formation. Progressive repetition of this treatment, however, eventually strongly depressed the carbon dioxide formation.

The difference between the behavior of a dried soil and that of a moist soil is considered to be directly proportional to the soil productivity.

The movement of soil moisture in the vapor phase, Parts I, II (*Abs. in Jour. Amer. Soc. Agron., 17 (1925), No. 10, pp. 642, 643*).—This is an abstract of two papers presented at the ninth annual meeting of the American Society of Agronomy at Fort Collins, Colo., June 18–20, 1925. The first, by J. C. Russel, deals with some theoretical considerations, and the second, by H. E. Weakley, with experimental observations.

Laboratory and field data, from studies conducted at the Nebraska Experiment Station, were presented to show the magnitude and importance of vapor movements. The evaporation of water from a free water surface into the atmosphere directly or through dry porous material, either soil or sand, was shown to be a linear function of saturation deficit. The rate of evaporation varied with the porosity of the material, but was not affected by its hygroscopicity. As much water passed from a free water surface through dry, coarse sand as through dry, coarse granular soil of identical permeability coefficient. The size rather than the quantity of pore space determined the extent of the water lost. Cracks in a soil mass seemed to allow very rapid vapor movement.

The evaporation of water from a wet mass of soil when not more moist than the field carrying capacity seemed to follow all of the laws of vapor movement. As much water was lost from wet soil columns when they were broken by air gaps as when they were continuous.

Soil moisture in relation to the growth of crop plants, H. L. Shantz (*Jour. Amer. Soc. Agron., 17 (1925), No. 11, pp. 705–711*).—In a contribution from the U. S. D. A. Bureau of Plant Industry data are presented on the utilization of water by plants as a basis for studies of the movement and retention of water in soils.

Soil reactions in relation to plant successions in the Cincinnati region, S. Geisler (*Ecology, 7 (1926), No. 2, pp. 163–184, figs. 8*).—Studies conducted at the University of Cincinnati are reported which indicate that the type

of soil which prevails in the successional stages is readily detected in the climax.

A prevailingly acid or alkaline condition was noted in the reactions of each of the successions. The soils of the upland successions were acid in reaction due to lack of drainage and poor aeration. All successions except the upland were found to be essentially alkaline in reaction due to the nature of the underlying rocks. The influence of the rock materials was more marked in earlier than in later stages of succession. In every succession the earliest stages were found to be rather limited in their range of reaction, while the later stages had a wider range.

The results indicate that many species grow under widely varying soil conditions, and that there is nothing to indicate that the soil reactions are responsible for species distributed in the Cincinnati region. There seems to be no definite progression of soil reactions in relation to the plant successions in the region, but rather a widening of the range of reactions as the climax is approached.

Relation of soil to plant cell sap, M. M. McCool (*Michigan Sta. Quart. Bul., 9 (1926), No. 2, pp. 60–64*).—Studies are briefly reported which indicate that the use of fertilizers lowers the freezing point of cell sap, and that the phosphorus content of the cell sap of plants is affected by soils and their fertilization. The addition of potash to muck soil increases the concentration of the juice of the leaves of such crops as sugar beets and carrots. It appears further that the amount of inorganic phosphorus in the cell sap varies with the time of day, being greater in the morning than later on in the day.

The growth of certain microorganisms in planted and in unplanted soil, J. K. Wilson and T. L. Lyon (*New York Cornell Sta. Mem. 103 (1926), pp. 3–25*).—Studies are reported in which soil was placed in large tubes, and after these had been heated in an autoclave and inoculated with pure cultures of selected organisms, sterilized seeds of maize or timothy were planted in some of the tubes, while others remained unplanted. After the plants had grown for periods varying from several days to a few months, the soil was removed from both the planted and unplanted tubes, dilute infusions were plated, and colonies were counted after incubation.

With few exceptions the soil in which plants were grown contained a larger number of organisms than did the unplanted soil. The organisms used were in every case those known to be active in changing nitrogen from one form to another.

The conclusion is drawn that at least some crop plants produce a condition in the soil surrounding their roots which favors the growth of certain microorganisms that consume nitrate nitrogen, thus accounting for the disappearance of nitrate nitrogen not absorbed by plants.

[Soil bacteriology work at the Delaware Station], T. F. Manns (*Delaware Sta. Bul. 147 (1926), pp. 35–37*).—Studies by P. Mautz showed that certain of the sulfates strongly stimulate sulfur oxidation. Potassium sulfate was the most active in this respect, while iron, aluminum, ammonium, and magnesium sulfates showed some stimulation. Sulfur oxidation was found to take place rapidly whether in soil or organic composts.

Pot studies with wheat to learn the relative availability to plants of phosphorus made citrate soluble by the sulfur oxidation process and that in commercial fertilizer showed that the noncomposted, nonavailable phosphorus-sulfur mixtures with activators to stimulate sulfur oxidation gave as good results as commercial fertilizer, with only one exception.

Distribution of Azotobacter in Bavarian soils with reference to their reaction and lime and phosphoric acid contents [trans. title], H. NIKLAS, H. POSCHENRIEDER, and A. HOCK (*Centbl. Bakt.* [etc.], *2. Abt.*, *68* (*1926*), *No. 1–7*, *pp. 16–28*).—Studies are reported of a number of Bavarian soils. The results are taken to indicate that the natural occurrence of Azotobacter in soils is governed very largely by reaction and lime content, and that many soils, in spite of their favorable reaction and high lime content, contain no active Azotobacter because of a deficiency in phosphoric acid. Apparently such soils can contain Azotobacter, but these are unable to assimilate nitrogen.

Nitrate studies on a manured and unmanured soil under continuous wheat culture, H. F. MURPHY (*Jour. Amer. Soc. Agron.*, *17* (*1925*), *No. 11*, *pp. 734–741*).—Studies conducted at the Oklahoma Experiment Station are reported which showed that nitrates were produced in much larger quantities in manured soil than in unmanured soil. Nitrification experiments showed that the manured soil produced 1.68 times more nitrates than the unmanured soil for a period of two months in the greenhouse and 2.24 times as much nitrates as the unmanured soil under open-room conditions. During July, with optimum moisture present, the manured soil produced under open-room conditions 1.74 times the amount of nitrates produced by the unmanured soil.

Nitrification was greater under greenhouse conditions than outdoors for both manured and unmanured soils. Similar ratios existed in both cases favoring the manured soil. Spring growth started later on the unmanured plat, and the manured soil was superior to the unmanured soil with reference to nitrates present, nitrification, moisture retention, and plant growth. It was found that the amount of nitrates present in the soil under each treatment is rapidly reduced as soon as the spring growth of wheat begins.

[Soil fertility studies at the Arkansas Station] (*Arkansas Sta. Bul. 215* (*1926*), *pp. 3–7*).—The progress of soil fertility studies is briefly reported (E. S. R., 55, p. 17). Data are presented on forms of lime and phosphorus and sources of nitrogen and on the effect of cultivation on the accumulation of nitrates and moisture in the soil.

[Soil management and fertility studies at the Illinois Station] (*Illinois Sta. Rpt. 1926*, *pp. 8, 9–27*, *fig. 1*).—The progress results of a large number of soil fertility studies are very briefly summarized (E. S. R., 56, p. 212), which include data on the comparative value of livestock and grain systems of farming, the fertilizing value of crop residues and farm manure, the influence of limestone of different degrees of fineness on soil productivity, lime sources and liming practices, phosphate sources and fertilization practices, potash and sulfur fertilization practices, and the effect of legumes on soil productivity.

Some of the outstanding results obtained are that extreme fineness in limestone is not necessary on Illinois soils, and that moderate liming is more profitable than excessive liming. The soils of the State vary in their phosphate requirements, and apparently no one carrier of phosphate gives the best results. In practically all sections of the State responses to rock phosphate used with manure are much less than when it is used with crop residues in grain systems of farming. Except on certain peaty or alkali soils, the use of potassium salts on the soils of central or northern Illinois does not give economic returns. In the southern part of the State economic increases have been noted, especially in the corn crop. Sulfur apparently fails to increase crop yields on the soils of the State.

Soil treatment and crop production in the Nelson district, 1924–25, T. RIGG ET AL. (*Cawthron Inst., Nelson, N. Z., Dept. Chem. and Agr. Bul. 2, n. ser.* (*1926*), *pp.* [*19*]).—A series of short papers dealing with some of the soil problems of the Nelson district are presented. These are: Liming and Manu-

rial Experiments on Stoke Soils; Cropping on the Hope Plains, Nelson District; Scientific Treatment of the Soil, Motupiko and Motueka Valleys; Hay Experiments, Waimea Plains, Nelson; Lucern Experiments, Waimea Plains, Nelson; and Soil Treatment for Nelson Tomato Houses.

A preliminary investigation on the absorption of fertilizers by Ceylon soils, A. W. R. Joachim (*Ceylon Dept. Agr. Bul. 75 (1926), pp. 19, pls. 3*).—Four series of experiments are reported, the purposes of which were (1) to ascertain the absorptive power of Ceylon soils, and (2) to estimate the losses of fertilizers added to them through leaching by rainfall.

The absorptive power of soils for fertilizers was found to vary with the nature, compactive power, porosity, and moisture content. The fertilizer losses were slightly greater from moist soils than from air-dried soils. The nitrates of sodium and potassium were least absorbed, while soluble superphosphate and the sulfates of potassium and ammonium were most absorbed. Potassium sulfate was absorbed to a greater degree than potassium chloride.

It was found that the amount of fertilizer absorbed by a soil increases with time, but that by far the greater part of the absorption takes place during the first 2 hours. When the fertilizer was incorporated in the upper 3 in. of a 6-in. layer of soil, the loss of fertilizer due to a 2-in. rainfall during 2 hours was hardly appreciable. If 24 hours afterward a further rainfall of 1 in. occurred, only a very small proportion of the fertilizer was leached from the top 6 in. of the soil. However, in the case of nitrates of sodium and potassium the amounts lost in the drainage water were greater, being 6 per cent in the case of the latter and 15 per cent in the case of the former. Hardly any losses of the other fertilizers were observed.

Decomposition of stable manure in soil and its utilization by plants [trans. title], M. Bach (*Landw. Vers. Sta., 104 (1926), No. 5–6, pp. 245–284*).—Studies are reported on (1) the decomposition of stable manure in soils, (2) the influence of stable manure on the content of available nutrients in soil, (3) the utilization of the total soil nutrients by plants, and (4) the utilization of the nutrient content of stable manure.

The main oxidation of carbon was found to occur during the first year after the application of stable manure to soils. During this period approximately 75 per cent of the total carbon added was decomposed. After that period the oxidation of the stable manure carbon proceeded more slowly. Decomposition of the organic constituents of the stable manure naturally was more rapid during the warmer than during the colder periods of the year.

The carbonaceous material disappeared more rapidly in sand, clay, and shale soils than in other soils. The pentosans decreased more rapidly than the total carbon. The decomposition of lignin was much more slow than that of the pentosans.

After fertilization with stable manure the total and soluble nitrogen contents of the soil showed a considerable decrease due to denitrification and leaching. The content of phosphoric acid soluble in 1 per cent citric acid in soils was only slightly decreased after fertilization with stable manure, after which it remained uniformly the same. The soluble potash gradually decreased, however, due to leaching and fixation.

Soils planted to beets and rye naturally showed a decrease in nutrient materials. The beet crop was doubled by manuring. The rye yield was also considerably increased.

About 30 per cent of the nitrogen, 20 per cent of the phosphoric acid, and 50 per cent of the potash contents of stable manure additions were utilized by the rye and beet crops during the first two years after fertilization.

Substances in rains and snows, H. Rieble and P. Bowman (*U. S. Mo. Weather Rev., 54 (1926), No. 10, p. 424*).—Results of determinations of nitrogen compounds, sulfates, and chlorine in 57 samples of rain and 18 of snow at Cornell College, Iowa, are summarized. The 15.1 in. of precipitation from September 19, 1924, to June 3, 1925, carried in solution 4.65 lbs. per acre of nitrates, 0.07 of nitrites, 15.79 of free ammonia, 11.45 of albuminoid ammonia, 165.64 of sulfates, and 29.79 of chlorine. The 32.46 in. of precipitation from June 15, 1925, to May 31, 1926, carried in solution 5.9 lbs. per acre of nitrates, 0.27 of nitrites, 2.5 of free ammonia, 1.63 of albuminoid ammonia, 72.61 of sulfates, and 83.84 lbs. of chlorine. The chlorine content varied widely and is thought to be probably due to salt particles carried from the Atlantic Ocean.

Some tests with Soilgro, L. T. Leonard (*Jour. Amer. Soc. Agron., 17 (1925), No. 10, pp. 623–629*).—Tests conducted by the U. S. D. A. Bureau of Plant Industry of Soilgro, a so-called culture of soil bacteria, are briefly reported.

The total numbers of bacteria in the Soilgro cultures tested were found to be much lower than those in the so-called bacterial food accompanying the liquid cultures. Soil and manure samples plated for comparison gave higher figures. The numbers of ammonifying and cellulose-destroying bacteria were also larger in the bacterial food, soil, and manure samples than in the Soilgro cultures. The presence of Azotobacter in the culture was not indicated by the tests made. Certain strains of legume bacteria were found in Soilgro, but in less number than in the potting soil used for comparison.

Nitrogen fixation by potting soil was superior to the fixation by a Soilgro culture, and the mixtures of Soilgro gave a lower fixation in two cases than the culture from which they were made. The nitrification of ammonium salts in liquid and in soil cultures was better by potting soil than by any of the Soilgro preparations.

Soilgro showed no superiority in the production of radishes, either in the stimulation of germination, earliness of crop, or weight of crop, collectively or individually. Tests made with peas were likewise negative. Two tests on lawns did not produce results favorable to Soilgro. Quantitative tests on soil cuttings made from treated plats bore out the results of the superficial examination.

Spreading of lime nitrogen with soil [trans. title], E. Blanck and F. Giesecke (*Jour. Landw., 73 (1925), No. 4, pp. 305–316*).—Studies conducted at the University of Göttingen are reported which showed that composting lime nitrogen with soil and subsequent application of the mixture in the usual manner caused a considerable increase in crop yields. The conclusion is drawn that the injurious products of the decomposition of lime nitrogen exist only a short time as such and may be transformed into harmless and useful compounds during composting.

Mixtures of urea with phosphatic and potassic fertilizers [trans. title], P. Boischot (*Ann. Sci. Agron. Franç. et Étrang., 43 (1926), No. 1, pp. 45–50.*)—Studies conducted at the National Institute of Agronomy of France are reported which showed that urea may be mixed with the majority of phosphatic and potassic fertilizers. Mixtures of urea with alkaline fertilizers are not recommended owing to the resulting nitrogen losses.

Test soils for water-soluble phosphorus, C. H. Spurway (*Michigan Sta. Quart. Bul., 9 (1926), No. 2, pp. 64–67*).—Data on a simple field test are presented which are said to give information on fertilization needs.

Colloidal phosphate [trans. title], E. Bottini (*Staz. Sper. Agr. Ital., 58 (1925), No. 7–9, pp. 209–216*).—Studies of the physical and chemical properties of a finely pulverized phosphatic fertilizer are reported.

Only 9.79 per cent of the material showed apparent colloidal properties. About 63.06 per cent of the material consisted of particles 80 μ in diameter. The coarse material contained more phosphoric acid than did the fine material. The colloidal portion contained hardly a trace of phosphoric acid, and it consisted mainly of organic matter.

Treatment of this material with distilled water, saturated solutions of carbon dioxide, and solutions of neutral salts, both organic and mineral, dissolved out only traces of phosphoric acid, and only small quantities were soluble in ammonium citrate. Apparently solutions of citric and of citroformic acids were capable of dissolving out considerable phosphoric acid.

These results are taken to indicate that this so-called colloidal phosphate has no greater fertilizing value than other pulverized natural phosphates.

Cropping experiments with sericite as a source of potash [trans. title], E. BLANCK and F. ALTEN (*Landw. Vers. Sta., 104 (1926), No. 5–6, pp. 237–243*).—Experiments conducted at the University of Göttingen are briefly reported which showed that pulverized sericite as a source of potash increased the yield of peas and oats but apparently had little effect on mustard.

Degree of resistance of different limes toward acid solutions circulating in cultivated soils [trans. title], E. BOTTINI (*Staz. Sper. Agr. Ital., 58 (1925), No. 7–9, pp. 268–288*).—Studies are reported the results of which indicate that different forms of lime may be placed in three groups with reference to their resistance to decomposition by acid solutions of soils.

The first group comprises calcareous marls, concretions, sands, and fossils which are rather easily decomposed. The second group comprises the calcareous clays which present a higher degree of resistance to decomposition. The third and apparently most resistant group includes the dolomites and other hard lime compounds.

It was found that resistance to decomposition bears a relation to specific weight, a low specific weight corresponding to a low resistance. Resistance to decomposition was also found to bear a relation to geologic distribution. Compact lime formations found at the greater depths were less easily decomposed than more recent formations at less depths.

Residual effects of forty years continuous manurial treatment.—III, Ultimate fate and some physical and chemical effects of applied lime, J. W. WHITE and F. J. HOLBEN (*Soil Sci., 22 (1926), No. 1, pp. 61–74*).—In this third contribution (E. S. R., 55, p. 220), studies of the fate of two forms of lime and of the physical and chemical effects of continuous liming of soils are reported.

The results showed that the actual loss of calcium oxide from the normal plowed depth is not necessarily confined to that removed by drainage. It was found that the rate of limestone decomposition is influenced by the soil reaction.

H-ion studies showed that a soil treated with burnt lime had an average OH-ion concentration of 7.88, as compared to 7.68 where limestone was applied. Three months after burnt lime was applied the OH-ion concentration was 7.91, as compared to 7.81 39 months after lime application. This is taken to indicate that lime has therefore not maintained a high OH-ion concentration on this soil. Lime was found to have a tendency to reduce the water-soluble potassium by 7.1 per cent when used alone and 6.7 per cent when used with manure.

The Missouri fertilizer law, F. B. MUMFORD and L. D. HAIGH (*Missouri Sta. Circ. 152 (1926), pp. 4*).—The text of the law is presented and briefly discussed.

Testing fertilizers—spring, 1926, L. D. HAIGH (*Missouri Sta. Circ. 149 (1926), pp. 8*).—Guaranties and actual analyses of 102 samples of fertilizers

and fertilizer materials collected for inspection in Missouri in the spring of 1926 are presented.

Inspection of commercial fertilizers for 1926, T. G. Phillips, T. O. Smith, and A. W. Petre (*New Hampshire Sta. Bul. 225 (1926), pp. [1]+16*).—Guaranties and actual analyses of samples of 108 brands of fertilizers and fertilizer materials collected for inspection in New Hampshire during 1926 are presented.

AGRICULTURAL BOTANY

Corn stalks vs. field plots as a guide to the fertility requirements of the corn crop, F. A. Welton, V. H. Morris, and R. W. Gerdel (*Ohio Sta. Bul. 397 (1926), pp. 284–302, figs. 5*).—A report is given of a study of the Hoffer method of estimating plant food deficiencies by chemical tests of cornstalks (E. S. R., 56, p. 220), the tests being applied to corn plants grown on fertility plats on six soil types. The results of the chemical tests are tabulated in comparison with the yields.

The authors consider the results of their investigations as unfavorable for the method, as sometimes the tests were quite variable and often were conflicting when compared with the history of the fertilizer treatments of the plats.

The influence of potash on cotton bolls and foliage on a potash deficient soil, J. J. Skinner and W. F. Pate (*Jour. Amer. Soc. Agron., 17 (1925), No. 9, pp. 550–556, figs. 3*).—The results are given in detailed and tabular form of fertilizer experiments made in 1923 and repeated in 1924 with cotton on a Coastal Plain soil formed of Piedmont material brought down by water action. These results show striking needs of the soil for certain plant food materials for cotton production, also the influence of certain fertilizer elements on the character of the cotton plant and on the fiber produced by it.

Studies concerning the essential nature of aluminum and silicon for plant growth, A. L. Sommer (*Calif. Univ. Pubs. Agr. Sci., 5 (1926), No. 2, pp. 57–81, figs. 2*).—Experimentation to determine whether aluminum and silicon are essential to plant growth employed especially purified salts and redistilled water, all containers being coated with paraffin or Valspar deprived so far as possible by special treatment of any soluble constituent.

Addition of aluminum to pea cultures gave a small increase in total dry weight and a greater increase in seed amount. Aluminum with millet increased growth markedly, especially in case of the seed, these experiments suggesting that aluminum may be essential to millet. Silicon may also be essential to the growth of rice. Seeds of millet grown without silicon were seriously infected by fungi, those grown with silicon not being attacked.

Soluble aluminium in relation to plant growth in culture solutions and in acid soils, J. Line (*Brit. Assoc. Adv. Sci. Rpt. 93 (1925), p. 364*).—As here outlined, this account deals with the evidence on which the toxic aluminum theory of acid soils is based; the conditions under which aluminum is precipitated as hydroxide and as phosphate; the addition of aluminum salts to culture solutions and interaction of the plant and such culture solutions; and amounts of soluble aluminum found in acid soils and the growth of plants in soils so treated.

The toxicity of water distilled in metallic vessels, and its neutralization [trans. title], P. Lesage (*Rev. Gén. Bot., 36 (1924), No. 424, pp. 145–158*).—Experimentation with dwarf peas is described. Magnesium choride is thought to exert an antitoxic influence.

Copper injury to cabbage plants, L. R. Detjen and G. F. Gray (*Delaware Sta. Bul. 147 (1926), p. 26*).—Injury to cabbage grown in a greenhouse behind copper screens was traced to watering the plants through the screens, sufficient copper having been carried to the plants to cause their injury. Generally a soft rot followed the copper injury, and the plants died quickly.

Theory of regeneration based on mass action, II, J. Loeb (*Jour. Gen. Physiol., 6 (1923), No. 2, pp. 207–214, figs. 2*).—The polarity in the regeneration of an isolated piece of stem of *Bryophyllum calycinum* expresses itself by the characteristic facts first, that regeneration occurs only at the extreme ends, and, second, that the character of the regenerated organs is different at the opposite ends, shoots being formed at the most apical nodes and roots at the extreme basal end of the piece. Explanation which has been offered is discussed in view of facts set forth previously (E. S. R., 51, p. 731).

Quantitative proof is furnished that all the material available for shoot and root formation in an isolated leaf of *B. calycinum* flows to those notches where, through the influence of gravity or by a more abundant supply of water, growth is accelerated. As soon as acceleration of growth in these notches commences, the growth of the shoots and roots in the other notches which may already have started ceases. "Analogy with the behavior of regeneration in a leaf in which the growth in one set of notches is accelerated suggests that in an islolated stem a more rapid growth is favored at the extreme ends (probably by a block of the sap flow at the extreme ends), and that when this happens the total flow of ascending sap goes to the most apical buds and the total flow of the descending sap goes to the most basal roots. As soon as this occurs, the growth of the other roots and shoots is suppressed."

[**Studies on the plasma membrane**], A. Weis (*Ztschr. Wiss. Biol., Abt. E, Arch. Wiss. Bot., 1 (1925), No. 1, pp. 145–186, figs. 9*).—This account of plasma membrane and plasma threads in the epidermis of *Allium cepa* resulted from work done toward a dissertation in the Botanical Institute of the University of Leipzig, 1922–1924.

Permeability in Beggiatoa mirabilis [trans. title], W. Ruhland and C. Hoffmann (*Ztschr. Wiss. Biol., Abt. E, Arch. Wiss. Bot., 1 (1925), No. 1, pp. 1–83, figs. 10*).—This is a contribution bearing upon the ultrafilter theory of plasma.

Changes in hydrogen-ion concentration in nutrient solutions.—I, In a culture with wheat. II, In cultures with rice, H. G. M. Jacobson (*Jour. Amer. Soc. Agron., 17 (1925), No. 9, pp. 577–586*).—Experimentation is described in the first part of this report as carried out with wheat plantlets in dilutions of Group III solution R_4S_1 of the National Research Council series. Considerable change occurred in this solution when subjected to 100-day plants for 3 days. Increase in pH values in the solution was thought to be due to the anion of KNO_3 being taken up more rapidly than the cation, thus leaving potassium to form a basic compound which in turn tended to neutralize some of the existing acidity. The changes in pH values and nitrogen concentrations were not due to biological activities. Root excretions were probably also a partial cause for the increase in pH values.

In the second part of this report an account is given of a similar investigation with the rice plant. Approximately 80 per cent of the total nitrogen of the solutions was removed gradually during the 3 days of the experiment. The pH values of the solutions changed from pH 5.0 to 3.0 after growing rice plants for one 3-day period. The decrease in pH was more marked after the cessation of photosynthesis. The main cause of the reaction changes [illegible]

is thought to be the CO_2 given off by the rice plant roots and absorbed by the cultural solution. A partial cause was, supposedly, the taking up of cations of salts having SO_4 anions by the rice plants, resulting in the formation of H_2SO_4.

The effects on plant plasma of H ions in different concentrations [trans. title], T. SAKAMURA and T. L. LOO (*Bot. Mag.* [*Tokyo*], *39* (*1925*), *No. 460*, *pp. 61–76*, *fig. 1*).—This contribution bears upon the concept of an isoelectric point for protoplasm. The work basing this account was done with *Spirogyra* sp. The results are given in tabular and graphical form, with discussion.

The genesis of starch in cereals [trans. title], H. BELVAL (*Rev. Gén. Bot.*, *36* (*1924*), *Nos. 427*, *pp. 308–324*; *428*, *pp. 337–356*; *429*, *pp. 395–411*).—Starch of cereals is formed apparently from carbohydrate substance elaborated by the leaves, which is delivered to the stem principally in the form of hexoses. One part of this is utilized immediately, a second part being held as reserve pending the appearance of the grain, to which the carbohydrates then migrate, undergoing transformation. Starch is lacking in green parenchyma, though sugar is evident. As regards the character of the reserves, maize and wheat are separable so as to constitute distinct classes, which are dealt with in some detail.

The influence of chemical agencies on starch content and osmotic values in stomatal guard cells [trans. title], J. ARENDS (*Ztschr. Wiss. Biol.*, *Abt. E*, *Arch. Wiss. Bot.*, *1* (*1925*), *No. 1*, *pp. 84–115*).—The effects of widely different chemical substances on osmotic values in stomatal guard cells are detailed, with generalizations.

A new product of sugar transformation by fungi [trans. title], W. S. BUTKEWITSCH (*Ztschr. Wiss. Biol.*, *Abt. E*, *Planta*, *Arch. Wiss. Bot.*, *1* (*1926*), *No. 5*, *pp. 657–665*).—The substance herein described was obtained from saccharine cultures of *Aspergillus oryzae*.

The significance of acid amids for nitrogen exchange in higher plants [trans. title], K. MOTHES (*Ztschr. Wiss. Biol.*, *Abt. E*, *Arch. Wiss. Bot.*, *1* (*1925*), *No. 2*, *pp. 317–320*).—Amids in older plants play as significant a rôle as in plants during germination. Details are given.

The rôle of asparagine in the transformations of nitrogenous materials in plants [trans. title], PRIANICHNIKOV (*Rev. Gén. Bot.*, *36* (*1924*), *Nos. 423*, *pp. 108–122*, *figs. 3*; *424*, *pp. 159–181*).—Ammonia constitutes both the beginning and the end of nitrogen transformations in the plant. Asparagine is an important phase in synthesis at a certain stage, the subsequent relations of which are outlined.

Light and growth, J. PRIESTLEY (*Brit. Assoc. Adv. Sci. Rpt. 93* (*1925*), *p. 357*).—"An attempt is made to bring to one common focus the phenomena of etiolation, including the remarkable morphological and structural changes included by very brief exposures of etiolated plants to light, and the facts of phototropism, as exhibited both in the higher plants and in fungus hyphae. An attempt is made to interpret the phenomena of phototropism without the employment of the terms 'stimulus' and 'response.'"

The daily course of photosynthesis in land plants [trans. title], S. KOSTYTSCHEW, M. KUDRIAVZEWA, W. MOISSEJEWA, and M. SMIRNOWA (*Ztschr. Wiss. Biol.*, *Abt. E*, *Planta*, *Arch. Wiss. Bot.*, *1* (*1926*), *No. 5*, *pp. 679–699*, *figs. 6*).—The authors have studied photosynthesis in *Lappa tomentosa*, *Phragmites communis*, and *Betula pubescens* as to its daily normal course and as to modifying causes. On cloudy days the rate of photosynthesis is significantly lower than on clear days.

The physiology of paraheliotropism, E. NUERNBERGK (*Beiträge zur Physiologie des Tagesschlafs der Pflanzen. Jena: Gustav Fischer, 1925, pp. 138, figs. 8*).—Discussing the so-called diurnal sleep of leaves as seen in 17 plants, the author holds that the phenomena usually dealt with under this term include as regards causation two distinct processes, diurnal sleep (in the strict sense of that expression) due to illumination and another phase here called heat sleep.

The distribution of geotropic sensitivity in negatively geotropic plant organs [trans. title], W. HERZOG (*Ztschr. Wiss. Biol., Abt. E, Arch. Wiss. Bot., 1 (1925), No. 1, pp. 116–144, fig. 1*).—Experimentation with parts of different plants is systematically reported. In all objects studied there was a local concurrence of sensitive zone and statolithic starch.

Temperature relations in wound reactions, M. C. POTTER (*Brit. Assoc. Adv. Sci. Rpt. 93 (1925), p. 361*).—Temperature raising and temperature lowering factors are considered.

The injection of lacunae as a sign of death in aquatic plants [trans. title], H. DEVAUX (*Rev. Gén. Bot., 36 (1924), No. 423, pp. 99–107*).—The spontaneous injection of aeriferous spaces in aquatic plants is always an accompaniment of death, being strictly localized in the parts which are dead. The injection of the spaces indicates, indirectly, a disorganization of the protoplasm more profound than simple coagulation.

[Seeds and X-rays], S. ANCEL (*Bul. Soc. Bot. France, 72 (1925), No. 1–2, pp. 195–199*).—The germination period of seeds of *Phaseolus vulgaris* was not affected by exposure to X-rays of different intensities.

Torsion in developmental movements of leaves, A. SEYBOLD (*Über die Drehung bei der Entfaltungsbewegung der Blätter. Jena: Gustav Fischer, 1925, pp. 80, figs. 64*).—A study, featuring the viewpoint of Goebel (E. S. R., 53, p. 324), regarding teleology and actual causation in floral developmental movements is detailed.

Accessory buds, W. SANDT (*Zur Kenntnis der Beiknospen. Jena: Gustav Fischer, 1925, pp. 160, figs. 50*).—An extended study of accessory buds deals also with problems of correlation.

Biological study of the blooming of flowers [trans. title], A. DAVY DE VIRVILLE and F. OBATON (*Rev. Gén. Bot., 36 (1924), No. 422, pp. 49–67, pls. 3*).—These experiments are claimed to have enabled the authors, by a study of the isolated action of each of the different meteorological factors, to ascertain the part played by each factor as influencing the opening and closure of flowers.

Seeds and plants imported by the Office of Foreign Plant Introduction, Bureau of Plant Industry, during the period from January 1 to March 31, 1924 (*U. S. Dept. Agr., Inventory 78 (1926), pp. 34*).—Lists are given, together with economic notes, on about 475 lots of seeds and plants introduced for testing in various parts of the United States.

Bergey's manual of determinative bacteriology, D. H. BERGEY ET AL. (*Baltimore: Williams & Wilkins Co., 1925, 2. ed., pp. XVI+462*).—A key for the identification of organisms of the class Schizomycetes was arranged by a committee of the Society of American Bacteriologists, consisting of D. H. Bergey as chairman, with F. C. Harrison, R. S. Breed, B. W. Hammer, and F. M. Huntoon. "The committee does not regard the classification of species offered here as in any sense final, but merely a progress report leading to more satisfactory classification in the future." As no bacteriological code had been formulated for bacteriologists, the committee used the International Rules of

Botanical Nomenclature adopted by the International Congress of Vienna, 1905, and Brussels, 1910, in so far as these rules were applicable to bacteriology. An index prepared by R. S. Breed concludes the volume.

GENETICS

Genetics and eugenics in South Africa: Heredity and environment, J. E. DUERDEN (*So. African Jour. Sci., 22 (1925), pp. 59–72, pl. 1*).—The author calls attention to marked differences in the development of hereditary characters under varying conditions of environment, with special reference to the effects of environment on the development of the European and native races in South Africa.

A critical study of the nature of hereditary factors [trans. title], A. A. LIÛBISCHCHEV (LUBISCHEW) (*Izv. Biol. Nauch. Issledov. Inst. Permsk. Gosud. Univ. (Bul. Inst. Recherches Biol. Univ. Perm), 4 (1925), Sup. 1, pp. 142; Eng. abs., pp. 126–142*).—A critical analysis is presented of the various conceptions of the nature and potentialities of hereditary factors which have been presented by various investigators, many of which are more or less contradictory.

The new preformationist doctrine, C. YAMPOLSKY (*Genetica [The Hague], 7 (1925), Nos. 5–6, pp. 507–516*).—In contrast to the original preformationist doctrine that the individual was present in miniature in the germ cells the new doctrine assumes the organization of determiners for the various characters within the nuclei of the egg and sperm cells.

Recent advances in cytology, L. W. SHARP (*Amer. Jour. Bot., 11 (1924), No. 10, pp. 610–616*).—A brief outline, with concluding remarks, presents phases of recent progress in cytological interests.

Cytological studies in the genus Crataegus, A. E. LONGLEY (*Amer. Jour. Bot., 11 (1924), No. 5, pp. 295–317, pls. 3, figs. 8*).—Study of material collected at the Arnold Arboretum of Harvard University gave indications that the members of the polymorphic genus Crataegus can be grouped into diploid species with the chromosome number 16, triploid and tetraploid species able to develop their pollen mother cells to the tetrad stage, and triploid and tetraploid species in which the pollen mother cells have thin and vacuolated cytoplasm and seldom develop to the tetrad stage. These are discussed as to characters and behavior.

Soy bean investigations, G. L. SCHUSTER (*Delaware Sta. Bul. 147 (1926), p. 6*).—Cytological studies of the soy bean showed the presence of seven chromosomes and that they are short and thick.

The maturation divisions in relation to the segregation of homologous chromosomes, E. E. CAROTHERS (*Quart. Rev. Biol., 1 (1926), No. 3, pp. 419–435, figs. 2*).—From a discussion of the literature bearing on the maturation division in which reduction occurs, it is concluded that neither maturation division may be rightly called a segregation division, but that the two maturation divisions are essentially a unit process and segregation may occur in either.

Chromosome numbers in crop plants, H. C. AASE and L. POWERS (*Amer. Jour. Bot., 13 (1926), No. 6 pp. 367–372, pls. 2*).—Counts at the Washington Experiment Station showed the chromosome numbers of *Triticum monococcum* to be 7, *T. dicoccoides*, *T. turgidum*, *T. dicoccum*, and *T. durum* 14, *T. spelta*, *T. compactum*, and *T. vulgare* 21, *Avena wiestii*, *A. brevis*, and *A. strigosa* 7, *A. sativa* 21, *Hordeum spontaneum* and *H. vulgare* 7, *H. murinum* and *H. jubatum* 14, *Secale cereale* 7, and *Aegilops cylindrica*, *A. triuncialis*, *A. squarrosa*, *A. ovata*, and [illegible] 14. A summary of chromosome

counts in crop plants and related forms, omitting species counted by the authors, is also included.

Chromosome VIII in maize, W. H. EYSTER (*Science, 64 (1926), No. 1644, p. 22*).—At least five factor pairs, of which four are described as new, were found at the University of Maine to be linked with *Pr pr* factor pair, which modifies aleurone color in corn from red to purple and which does not seem to belong to any of the seven linkage groups already reported in corn. These factor pairs include *Bm bm*, which, when homozygous recessive, causes a water-soluble, yellowish-brown pigment to develop in the cells of the midrib and sheath of the leaves; Sc_1 sc_1, for scarred endosperm (E. S. R., 48, p. 437); Fi_2 fi_2, for a fine striping of the chlorophyll, which appears in young seedlings and persists through the life of the plant; *Yg yg*, which, when homozygous recessive, causes the seedling as well as the growing plant to be distinctly yellowish-green in color, due to a deficiency in the chloroplastid pigments; and *Tn tn*, which, when homozygous recessive, produces a small slender plant with a usually very small ear shoot, a small unbranched tassel, and leaves always strongly tinged with anthocyanin.

"This group of linked factors is especially interesting in that it represents a new chromosome in maize, to be designated as chromosome VIII."

A chemical conception of genes [trans. title], H. SCHMALFUSS (*Ztschr. Induktive Abstam. u. Vererbungslehre, 41 (1926), No. 1, pp. 111, 112*).—The author considers the gene in the light of a catalytic agent in chemistry.

Mutations in the sweet potato, J. T. ROSA (*Jour. Heredity, 17 (1926), No. 5, pp. 167, 168, pl. 1*).—A root longitudinally striped with white and yellow, two white roots, and several normal yellow roots were borne on a plant of the Yellow Jersey sweet-potato variety at the California Experiment Station. The striped root is considered a sectorial chimera. In the crop from the mutant plants the plants having white roots were inferior in yield to their yellow brethren. A hill of Nancy Hall bearing white potatoes and its progeny are also described.

On the irrelevant nature of the question whether new characters can be produced by fresh combinations of pre-existing ones, J. P. LOTSY (*Genetica [The Hague], 7 (1925), Nos. 5–6, pp. 517–520*).—The author compares the production of new characters by recombinations of preexisting ones to the ability of the chemist to produce new substances by recombinations of elements.

Some wool characters and their inheritance, C. B. DAVENPORT and E. G. RITZMAN (*New Hampshire Sta. Tech. Bul. 31 (1926), pp. 58, figs. 3*).—Studies of the wool characters of the animals used in the cross-breeding experiments, of which the inheritance of traits of conformation was previously noted (E. S. R., 50, p. 26), are reported.

Fleece weight was found to be considerably affected by age, feeding, and general environmental conditions, and was therefore very difficult to analyze genetically. In the F_1 hybrids of Rambouillet ewes with Hampshire and Southdown rams and of Oxford ewes with Rambouillet ram, the fleece weight was nearer to that of the Down parent, but exceeded it slightly except in the Oxford cross where the fleece was lighter than that of either parent. In later generations the fleece was improved by selection and there was evidence of segregation, especially in the scoured fleece weight.

The diameter of the wool fibers of the F_1 crosses was variable but intermediate between the parents, indicating that the parental races, especially the Hampshires, are heterozygous with regard to the factors responsible. In the Southdown × Rambouillet cross the F_2 generation was less variable with respect to the diameter of the fiber than the F_1, due to the fact that both sires and

dams were selected for intermediate wool diameter. The variability was again reduced in the F_3 generation by the same means. There was no evidence of a permanent blend in the F_1 generation, but the F_2 average may be moved in either direction according to the genotype of the parents. Fineness of wool is evidently controlled by multiple factors. As in the case of the fineness of wool, the variability of the length of fiber tended to diminish in successive generations, but there seemed to be no physiological dependence of small diameter on shortness of fiber.

Crimpiness was also intermediate in its mode of inheritance, though there was an inclination of the F_1 toward the more crimpy parent. Correlation coefficients indicated that there was no significant relation between crimp and diameter of fiber though a positive correlation between percentage of crimp and length of fiber was indicated, probably due to the fact that the more crimp there is the more the fiber can be elongated.

Lethal factors with regard to their behavior in domestic animals and in man [trans. title], O. L. MOHR (*Ztschr. Induktive Abstam. u. Vererbungslehre, 41 (1926), No. 1, pp. 59–109, figs. 10*).—This is a discussion of the various lethal and semilethal factors in man, animals, and Drosophila, including their mode of inheritance.

A case of pollen dimorphism in maize, M. DEMEREC (*Amer. Jour. Bot., 11 (1924), No. 7, pp. 461–464, fig. 1*).—By treating the pollen of heterozygous corn plants with iodine, it was found that segregation could be detected in the gametophytic generation. Plants heterozygous for waxy endosperm had about 50 per cent waxy and 50 per cent starchy pollen grains in one and the same pollen sac. The case resembled that described by Parnell (E. S. R., 48, p. 28) for rice.

On the nature and the conditions of the formation of esculent roots.—Preliminary report [trans. title], E. SINSKAIA (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant-Breeding), 16 (1926), No. 1, pp. 3–35, figs. 4; Eng. abs., pp. 26–35*).—Crosses between the edible radish with esculent roots and a wild form without enlarged roots yielded in the F_1 generation all thin roots, followed by segregation into thin, intermediate, and esculent types in the F_2. On the other hand, crosses between the oleiferous radish (thin root) and the common radish yielded enlarged roots in the F_1 and no regular splitting in the F_2. Apparently the thin root of the wild radish and the thin root of the oleiferous radish are of different genetic nature.

In crosses between *Brassica campestris* and *B. napus*, both thin rooted forms, the F_1 forms were generally intermediate. The occurrence of enlarged roots in a stock of *B. juncea*, a normally thin-root species, is believed to be due to natural hybridization. In the F_2 generation of crosses between *B. juncea* and *B. chinensis*, both thin-root forms, there was noted one strain with esculent roots.

Pointing out that soil fertility and moisture and the source of seed also function in the production of enlarged roots, the author concludes that the ability to produce edible roots is the product of the interaction of genotype and environment.

Barley with orange lemmas [trans. title], A. BAUMAN (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant-Breeding), 16 (1926), No. 3, pp. 181–186; Eng. abs., p. 186*).—Crossing a hulled 2-row barley (*Hordeum distichum ucrainicum*), showing lemmas colored a distinct orange, which was also spread over the rachis, with other varieties gave rise to a series of new constant orange-pigmented forms. The orange color is evidently recessive.

The variability of crossing over in maize, L. J. Stadler (*Genetics, 11 (1926), No. 1, pp. 1–37, figs. 6*).—Significant observations in this contribution from the University of Missouri have been recorded from another source (E. S. R., 54, p. 728).

Hybrid vigor in cowpeas, F. W. Hofmann (*Jour. Heredity, 17 (1926), No. 6, pp. 209–211, figs. 2*).—F_1 reciprocal hybrids from California Black Eye × Blue Goose cowpeas were intermediate in flower color in greenhouse and field cultures at the University of Illinois but exhibited heterosis in diameter of stem, plant height, and potential seed yield. The hybrids bloomed much later than either parent.

The segregation of Oenothera nanella-brevistylis from crosses with nanella and with lamarckiana, B. M. Davis (*Genetics, 11 (1926), No. 1, pp. 57–72*).—The studies reported were carried on at the University of Michigan.

A haploid wheat plant, E. F. Gaines and H. C. Aase (*Amer. Jour. Bot., 13 (1926), No. 6, pp. 373–385, figs. 10*).—Pollination of Hybrid 128, *Triticum compactum humboldtii*, with pollen of *Aegilops cylindrica* at the Washington Experiment Station resulted in a plant resembling the female parent but almost completely (99.8 per cent) sterile, producing 9 seeds.

Cytological studies revealed that the nuclei of the spore mother cells and of the somatic cells of the stamens and pistils contained 21 single chromosomes. Sporogenesis was irregular, the 21 unpaired chromosomes were distributed in the first division, apparently by chance, to the two poles, and chromosomes frequently strayed into the cytoplasm. Pollen grains varied greatly as to size and as to the number of nuclei contained. Giant multinucleate pollen grains were sometimes found as a result of the coalescence of contiguous pollen mother cells. Fusion of somatic nuclei in pairs, and subsequent mitosis, frequently occurred in ovaries and anthers.

The haploid Hybrid 128 is triploid in respect to the genus Triticum, and its nuclei probably contain 3 dissimilar sets of 7 chromosomes each. Synapsis fails, possibly on account of the absence of homologous chromosomes. The absence of homologous mates seems to be as fatal to orderly meiosis as the presence of inharmonious chromosomes in hybrid offspring.

On the actual existence of leporides, K. Kuiper (*Genetica [The Hague], 7 (1925), Nos. 5–6, pp. 471–474*).—The author describes several crosses of rabbits and hares which have produced offspring in the experimental garden of Mr. Houwink in the Netherlands. The leporides produced also proved to be fertile.

Correlation and machine calculation, H. A. Wallace and G. W. Snedecor (*Iowa Agr. Col. Off. Pub., 23 (1925), No. 35, pp. 47, figs. 6*).—The meaning and uses of the various correlation coefficients, simple, partial, and multiple, are presented in nontechnical language, and explicit directions are set forth for the use of the usual commercial forms of calculating machines, either key-driven or crank-driven, in finding correlation coefficients or related constants.

On the correlation between the weight of new-born and that of growing and of full-grown rabbits [trans. title], S. Kopeć (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Puławach (Mém. Inst. Natl. Polon. Écon. Rurale Puławy), 6 (1925), A, pp. 288–329, figs. 2; Eng. abs., pp. 325–329*).—In continuing the studies of the inheritance of weight in rabbits (E. S. R., 52, p. 331), weights at birth and at 10-day intervals to 90 days and at 30-day intervals to 390 days are reported on 30 male and 30 female F_2 rabbits from the cross Himalayan ♀ × Silver ♂. By classifying the individuals into five groups according to their birth weights, it was found that the mature weights ranked in the same order as the birth weights. Significant positive correlation coefficients were calculated between the birth weights and the weights at the different ages in prac-

tically all cases for males and females. It is, therefore, concluded that inferences as to the inheritance of mature size may be drawn from the weights at birth. When grouped according to litter size there was no such relation between birth weights and the weights at the different ages, and part of the correlation coefficients were positive while others were negative. Females were generally slightly heavier than males.

Studies of growth according to the percentage monthly increment in live weight showed, when plotted, that the curve was bimodal, the one mode occurring in the second month and the other in the seventh month. Four periods are distinguished by the author for the rates of growth of the rabbits under investigation, i. e., first month, second to sixth month, seventh to ninth month, and tenth to thirteenth month. Growth was completed by the end of the third period. The percentage monthly increment in weight was inversely related to the birth weights.

Ovulation in the rabbit, F. F. Snyder (*Abs. in Anat. Rec., 32 (1926), No. 3, p. 242*).—Studies of the oestrous cycle and ovulation in 18 rabbits between 6 and 12 months of age indicated that no regular cyclic changes occurred in the vaginal smears or in the vaginal wall, but mating occurred readily in nonpregnant animals at all times and was followed by ovulation. Ovulation was indicated by the recovery of ova from the Fallopian tubes. Ovulation without mating was not observed.

Anthropological studies of single and double ovum twins [trans. title], O. v. Verschuer (*Ztschr. Induktive Abstam. u. Vererbungslehre, 41 (1926), No. 1, pp. 115–119*).—The differences in the weights and measurements at various ages of 93 single ovum and 43 double ovum twins have been determined. The average and percentage differences between the individuals of the pairs were obviously greater in the twins from 2 ova than in the twins from a single ovum, though wide variations in the relation of these differences were found in the several parts measured. Attention is called to a possible relation between the left- or right-handedness of males and the comparative placement of the left and right testicles, as well as to the corresponding location and pressure on double ovum twins in utero.

Invariable production of deciduomata in the virgin rat with anterior hypophyseal fluid, H. M. Teel (*Abs. in Anat. Rec., 32 (1926), No. 3, p. 248*).—Deciduomata were regularly produced in virgin rats by the insertion of silk threads into the uterus after the administration of anterior hypophyseal fluid, though under ordinary conditions without the administration of this substance deciduomata are relatively impossible to produce in the virgin rat. Such results did not follow in spayed rats.

On the analysis of the morphogenesis in animals, M. Zawadowsky (*Biol. Gen., 2 (1926), No. 3, pp. 352, 353*).—From the results of experiments with various breeds of fowls, ducks, pheasants, antelopes, bulls, deer, and rams, in which gonad tissue from one sex was transplanted to the other sex, the author concludes in general that both sexes have the same potentialities for development, except that certain modifications are brought about by the hormones produced by the sex glands. A partial inequality of the potentialities of the characters independent of sex is, however, admitted.

Chemical differences in blood as related to sex, L. J. Needels (*Abs. in Anat. Rec., 32 (1926), No. 3, pp. 238, 239*).—In studies with rats and monkeys at the University of Missouri School of Medicine, the sex glands have been found to play an important rôle in the Manoilov reaction. The animals used consisted of females at different stages of the oestrous and menstrual cycles, castrated males and spayed females, and spayed females in which oestrum was

produced by injection of ovarian and placental hormones. From these studies it was concluded that the degree of decolorization of the blood was greater in males and in young animals than in females and older animals. The oxidation was greatest in rats during oestrum and in monkeys during the intermenstruum period. The reaction was decreased by the removal of the ovaries, but increased by the injection of ovarian and placental hormones into spayed animals. Castrated males tended to react as females, while stunted and diseased animals gave atypical results.

FIELD CROPS

Mathematics and agronomy, STUDENT (*Jour. Amer. Soc. Agron., 18 (1926), No. 8, pp. 703–719, figs. 3*).—A discussion of the mathematical analysis of the results of agronomic experiments.

The arrangement of field experiments, R. A. FISHER (*Jour. Min. Agr. [Gt. Brit.], 33 (1926), No. 6, pp. 503–513, fig. 1*).—In dealing with the class of error held due to soil heterogeneity, the author questions the significance of a result and discusses the measurement of accuracy by replication, wrongly estimated errors, distinction between errors, random plat arrangement, the Latin square, and complex experimentation.

[Field crops experiments in Arkansas] (*Arkansas Sta. Bul. 215 (1926), pp. 7–23, 49–51*).—Among continued experiments (E. S. R., 55, p. 29) reported on were varietal trials with cotton, corn, wheat, oats, rye, barley, sorgo, soy beans, cowpeas, alfalfa, peanuts, potatoes, and sweet potatoes and breeding work with cotton, corn, oats, wheat, and sweet potatoes.

In nutrition studies with rice an abandoned rice soil gave the best growth through the period up to May 15; from then to maturity a typical rice soil which had been growing rice for several years appeared to excel in crop growth and development. A virgin rice soil showed the poorest growth and matured the rice later than the two other soils. In greenhouse fertilizer tests the abandoned soil made its highest yield with an application of ammonium sulfate with acid phosphate, the cropped soil with cottonseed meal in combination with acid phosphate and potassium, and the virgin soil with cottonseed meal, phosphoric acid, potassium, and lime.

Marked progress was reported in breeding for oil and nitrogen content of cotton seed. The season apparently tended to augment the protein content of the seed, whereas the reverse was observed as to oil content. Selections from commercial cotton varieties were noted for their increase in yield and in earliness over the parent stocks. Spacing results for the year favored a thick stand resulting from light thinning.

Cultivation of corn to a medium depth again surpassed other methods at the station, losses being recorded from very shallow cultivation, delayed cultivation, no cultivation, and none except weeds hoed off. Some yield increases followed deep cultivation at Scott, whereas delayed cultivation, no cultivation, and laying by early resulted in marked reduction. Planting experiments over a period indicated April 15 as the surest date at the station and from June 1 to 15 at Scott. Corn grown with cowpeas, soy beans, and velvet beans averaged 38.3 bu. per acre, while corn grown alone made 46.4 bu. Interplanting of legumes may have a certain merit on very small farms where small fields are cultivated, especially in hilly areas where much hand work is involved. Tests at Scott indicated that corn row widths may be increased advantageously to some extent with legumes between the rows. However, with rows at about twice the normal width corn yields declined.

to measure the effects. Data thus far obtained showed that, when no other crop is grown on the land in the season, using the legumes for hay results most profitably, whereas when legumes can be grown after a crop such as early harvested oats, it is well to plow under the legumes. Peanuts seemed to yield best in close plantings, i. e., 8 to 12 in. apart in 2.5-ft. rows. The merits of lespedeza, bur clover, hairy vetch, sweet clover, beggar weed, Canadian and Austrian field peas, and velvet beans are detailed from the results of tests.

Frequent cutting of alfalfa resulted in slightly larger annual hay production and a noticeable reduction of stand. Permitting the alfalfa to remain as long as feasible without heavy loss of foliage seemed desirable for lasting stands. Manure was more effective than commercial fertilizer, although both helped to prolong the duration of the stand. Cultivation after each cutting with a loaded spike tooth harrow was not very effective. Apparently alfalfa first gives out and weeds follow closely in its wake instead of the weeds crowding out the alfalfa. Grimm alfalfa has proved superior to other alfalfas tested.

Fertilizer recommendations are made for potatoes (E. S. R., 55, p. 435) on different soil types. Certified northern seed again outyielded good commercial northern stock. During attempts to obtain immediate growth in freshly dug potatoes, the ethylene chlorohydrin method developed by Denny (E. S. R., 55, p. 829) resulted in 100 per cent germination of freshly dug potatoes within 10 days after treatment. It appeared that the ethylene treatment should be made below 70° F., although the germination of the treated seed proceeds most rapidly at soil temperatures of about 80°. Of the other methods tried, storing freshly dug tubers in a dry place at 80 to 90° with free air circulation has excelled. Tubers stored 4 weeks will sprout in 5 to 7 days provided the soil temperature is high.

The residue from acid phosphate applied to a previous crop of potatoes, tomatoes, or cotton is recommended for sweet potatoes. Where such land is not available from 300 to 500 lbs. of 12–4–4 fertilizer may be applied under the ridges or beds. The best stands and yields resulted from early plantings, and spacing slips from 12 to 16 in. apart in 30- to 36-in. rows reduced the proportion of oversized roots. Attempts to improve strains by hill selection resulted negatively. Storage studies showed the need of careful and rapid handling in the marketing of cured stock. Sweet potatoes cut and bruised at digging kept perfectly until spring with little more shrinkage than sound roots, but when injured after being stored until February rotted in from a few days to 2 weeks, depending on whether a high or medium low temperature was maintained.

[Field crops experiments in Illinois] (*Illinois Sta. Rpt. 1926, pp. 8, 9, 27, 34–38, 42–49, 133–136, figs. 2*).—Continued investigations (E. S. R., 56, p. 229) reported on embraced varietal trials with corn, oats, winter and spring wheat and barley, breeding work with these crops and rye, a storage test with potatoes, and rotations.

The 1925 crop from the high protein and low protein corn strains analyzed 18.3 and 7.43 per cent protein, respectively, and the high and low oil strains 10.21 and 1.43 per cent of oil. The respective heights of ear of the high ear and low ear strains were 99.8 and 9.7 in., and on the 2-ear strain 60 per cent of the stalks bore two or more ears. "Barren-sterile," a type of plant without shoot or tassel, appeared to be a simple recessive to the normal type in work by C. M. Woodworth and F. L. Winter.

In line with previous years, G. H. Dungan, W. L. Burlison, and B. Koehler found corn harvested for seed when mature to outyield corn picked in earlier stages. Seed corn placed in hangers November 30 and December 1 and

containing about 23 per cent of moisture in the grain was dried in several ways by E. W. Lehmann and R. C. Kelleher. The corn dried by 79.4 hours of forced heated air at 93° F. was not damaged in germination according to tests made April 24, whereas the seed dried by 207.6 hours of forced unheated air germinated 19.2 per cent below its December 1 record. Seed allowed to dry by natural ventilation suffered an 18 per cent reduction in germination. Experiments by J. C. Hackleman showed that the farmer can construct a satisfactory cabinet for corn germination at a moderate cost. Dungan observed that early maturing corn varieties again produced their highest yields when planted at an intermediate date, while the later sorts yielded best when planted early.

Increased yields due to mulching winter wheat with straw may not be expected every year, according to results obtained by O. H. Sears; however, the crop following the wheat may be improved. In barley improvement work by Woodworth and Winter the characters hooded, black, and rough awned differed from their respective allelomorphs bearded, white, and smooth awned by a single factor in each case.

In tests by J. J. Pieper a mixture of oats and peas and one of oats and vetch gave the highest hay yields of the early emergency hays, while soy beans and Sudan grass led in the late emergency hay series. In another series alfalfa grown alone yielded better than when grown with either red clover, winter vetch, timothy, or orchard grass. Timothy and orchard grass with alfalfa yielded little more than half the yield of alfalfa alone. A mixture of two alfalfa varieties did not outyield either variety grown alone.

[Field crops work in Northumberland County, England], D. A. Gilchrist (*Northumb. Co. Ed. Com. Bul. 38 (1926), pp. 10–58*).—The progress of previous experiments with field crops (E. S. R., 54, p. 231) is described.

[Report of the] Scottish Society for Research in Plant-breeding, W. Robb (*Scot. Soc. Research Plant Breeding Rpt., 1926, pp. 26, figs. 4*).—The progress of breeding work with different field crops is described as heretofore (E. S. R., 54, p. 231.)

Maori agriculture, E. Best (*New Zeal. Dominion Mus. Bul. 9 (1925), pp. VIII+172, pls. 27, figs. 23*).—An account of the cultivated food crops of the New Zealand natives, including the sweet potato, yam, taro, *Lagenaria vulgaris*, and *Cordyline* spp., with information on native agricultural methods, rituals, and origin myths.

East African pasture plants.—I, East African grasses, C. E. Hubbard, W. E. Trevithick, and J. Hutchinson (*London: Crown Agents for Colonies, 1926, pp. 56, figs. 28*).—Twenty grasses which commonly occur in East Africa (Kenya, Uganda, Tanganyika, etc.) are described and illustrated, with a description of a typical grass plant and details of the floral structure.

Pasture studies, R. G. Wiggans (*New York Cornell Sta. Mem. 104 (1926), pp. 3–59, pls. 4, figs. 3*).—The effects of fertilizers, lime, manure, seeding, and cultural treatments on the production and botanical composition of pasture areas representative of the most depleted (Turkey Hill), the generally unproductive (Bald Hill), and the high-grade pasture areas (university plats) of New York were studied during 5 years.

Acid phosphate resulted in significant increases in total vegetation under each of the conditions studied, the increases averaging about 20 per cent. Particularly on the poorer areas, the increase appeared almost wholly due to the higher proportion of grass and clover with increasingly fewer weeds.

Sodium nitrate, used only on the Bald Hill plats, produced a significant increase in total vegetation, largely by increases in grass and weeds with an

actual decrease in the clover. Apparently nitrogen might better be added to pastures through stimulation of legume production rather than by nitrogenous fertilizers. Potash, likewise used only on the Bald Hill plats, failed to give conclusive results and seemed of doubtful value as a fertilizer for pastures. On unlimed areas the increases consisted mostly of weeds, whereas on the limed areas an improvement in the quality of the product was apparent.

Lime gave very positive results in each of the tests. On the poorer areas the increases varied but averaged more than 100 per cent, while on areas previously limed the increase was consistent and was about 10 per cent. The average composition of the herbage on the Bald Hill plats changed from 5.3 per cent of clover, 26.6 of grass, and 68.1 per cent of weeds to 26.6, 43.7, and 29.7 per cent, respectively. The increases in grasses and clovers comprised the actual increases in total production and seemed to cause the decreases in weeds. A similar change was noted on Turkey Hill but not on the university pasture plats, where desirable vegetation was already established. Lime may give decided increases in production and improvement in quality on previously untreated pastures over a large area in New York.

Manure, used only in the Turkey Hill tests, resulted in an increase approaching 100 per cent in yield and in an improvement of the vegetation quality by a stimulation of white clover in particular.

Of the cultural methods tested on the low production areas, plowing decidedly altered the vegetative composition of the area for a short time after treatment by increasing grass and clover and decreasing weeds. However, the effect largely disappeared after 5 years, and the total production over several years was influenced only slightly. Greater benefits accrued from the manure on the cultivated than on the uncultivated plats. Plowing and cultivation of old pastures failed to be of distinct advantage in these trials, nor could reseeding be recommended as a means of renovating old pastures. Cutting trials showed that well-established pasture areas will usually produce more green weight and almost as certainly less dry weight when cut often as pasture than when cut once a season as hay.

[Experiments with legumes in Illinois] (*Illinois Sta. Rpt. 1926, pp. 26, 27, 28–34, fig. 1*).—Sweet clover grown on brown silt loam in studies by F. C. Bauer, H. J. Snider, E. E. DeTurk, and H. A. Lunt contained a high percentage of nitrogen, and consequently more than three times as much nitrogen per acre was obtained as in sweet clover on gray silt loam. Sweet clover on brown silt loam developed a single taproot system penetrating from 24 to more than 40 in., while that on gray silt loam produced a branching-root system penetrating from about 8 to 14 in. O. H. Sears found that late spring plowing of sweet clover for use as a green manure crop had no immediate advantage over earlier plowing. On the Sidell field early-plowed plats yielded 14.2 more bushels of corn per acre than those plowed later. Greenhouse studies with soil from the Ewing (Franklin County) field showed that sweet clover may be made more efficient as a green-manure crop for that soil by fertilizing with potassium salts.

Alfalfa studies by W. L. Burlison and J. C. Hackelman indicated that hardiness alone does not suffice to insure a good yield. Alfalfa cut in full bloom was killed out completely, while that cut in one-tenth bloom survived the winter in good shape. Grimm and Cossack, both variegated alfalfas, showed practically no winterkilling, Kansas-, Colorado-, and Idaho-grown common alfalfas were intermediate, while the already poor stand of Argentine alfalfa became even thinner. Variegated alfalfa continued to excel under

Clipping red clover in the fall of the first year continued to increase the yield of seed considerably in tests by J. J. Pieper and W. P. Flint, although hay yields were not materially enhanced thereby. One or two spring clippings were both prejudicial to seed yields. If the first crop is used for hay and the second for seed the yield of seed probably will be high enough to justify the practice. Poor seed production of alsike and Mammoth clover was also observed.

Illini and A. K. 2, selections from A. K. soy beans, were noteworthy for their seed production and Hong Kong, A. K., and Virginia led in hay yields. In tests by Sears the increases in soy bean yields as a result of inoculation have ranged from 5 per cent on fertile brown silt loam soils to more than 300 per cent on a dune sand soil. Proper inoculation also materially increased the protein content of hay and seed. Sears also found pure cultures of legume bacteria grown on artificial or laboratory media to be superior to soil for inoculating legumes when judged by the number of nodules obtained per plant. When the same legume is grown again in the same field good nodule development is had both from pure cultures and from soil. Either method of inoculation is rendered less effective by failure to sow the seed soon after inoculation. For best results bacteria should be applied to the seed within 24 hours of planting. The yields of wheat following soy beans cut for hay or for seed were found by Sears to be larger than the yields obtained from land on which oats or corn preceded the wheat.

In soy bean improvement investigations by C. M. Woodworth yellow seed coat in a cross between Sable and Manchu proved to be dominant to black, and in 15 crosses between yellow and green cotyledon varieties the segregation in cotyledon color indicated that the yellow parents carried two factors for yellow. But one yellow variety has been found possessing a single factor only. Further evidence of linkage between tawny pubescence and black hilum was obtained.

Sunflowers as compared with corn as a silage crop for New York, R. G. WIGGANS (*New York Cornell Sta. Bul. 456 (1926), pp. 3–29, figs. 10*).—Experiments on the growing for silage of sunflowers and corn, alone and in combination, are described, with observations on the merits of sunflowers in controlling weeds and a brief report on breeding work with sunflowers. The work of others on the composition of sunflowers and their feeding value as silage is reviewed, and objections to sunflowers as a silage crop are cited.

During 4 years various mixtures of corn and sunflowers harvested for silage resulted in yields of sunflowers disproportionate to the sunflower plants in the combination. Mixtures containing 25, 50, and 75 per cent, respectively, of sunflower plants resulted in from 50 to 75, from 80 to 90, and from 90 to 96 per cent by weight of sunflowers in the harvest. The dry matter percentage in the two corn varieties tested averaged materially higher than in the sunflowers. The percentage of grain in the corn decidedly decreased as the sunflower percentage in the mixture rose, being of slight significance when as high as 50 per cent of sunflower plants was in the mixture.

Sunflowers alone averaged 52 per cent more green weight and 38 per cent more dry weight than did corn grown alone. Mixtures of corn and sunflowers generally outyielded an equal area grown one-half to corn and one-half to sunflowers. In these tests the optimum spacing for sunflowers ranged from 6 to 9 in. apart in 36-in. rows. A greater percentage of dry matter was noted in the sunflowers as the planting rate increased.

While the experimental results did not recommend sunflowers for silage in

fall frosts make corn uncertain for silage, where very limited areas of highly productive land are available for crops and the most food possible on the given area is desired, and areas where a smother crop is wanted to aid in controlling grass and weeds.

The barley crop, H. HUNTER (*London: Ernest Benn, 1926, pp. VIII+166, pls. 2, figs. 6*).—This book describes the results of a series of experiments on barley culture conducted cooperatively since 1901 by the Department of Agriculture and Technical Instruction of Ireland.

The successive chapters deal with the botanical classification of the genus Hordeum, Irish barley soils, quality in malting barley, variety comparisons, selection experiments, the Danish barley experiments, the production of new varieties by hybridization, some conditions influencing the yield of grain, and economic results. Information regarding the technique of hybridization and conducting yield trials is appended.

Some observations on white clover and a method of distinguishing between the seeds of wild white and Dutch clover, F. M. J. ADAMS (*Ann. Appl. Biol., 13 (1926), No. 3, pp. 339–357, pls. 2, figs. 5*).—The frequency of certain shape types of seed, the average ratio of long diameter of seed to short diameter, the area of cotyledon, and the length of petiole of first foliage leaf were found useful in distinguishing samples of wild white from Dutch clover seed. At a later growth stage, prostrate habit and formation of axillary shoots characterize wild white clover. Permanence in wild white clover is due to a strongly developed power of vegetative propagation variously lacking in Dutch clovers.

Corn production in Kansas, S. C. SALMON (*Kansas Sta. Bul. 238 (1926), pp. 3–42, figs. 19*).—This is largely a revision of an earlier publication (E. S. R., 34, p. 529), and gives information on the adaptation of corn in Kansas, rotations, varieties, cultural and harvest methods, seed, and insects and control methods.

The relation of weather to the date of planting potatoes in northern Ohio, J. BUSHNELL (*Ohio Sta. Bul. 399 (1926), pp. 343–384, figs. 12*).—Efforts to harmonize the time of planting potatoes with climatic conditions in northern Ohio to insure maximum production are reported on, and planting dates are recommended for different sections of the State. The literature on the effect of weather on the potato crop and on date of planting experiments and practices is reviewed.

The growing season in northern Ohio is longer than required by the Rural group of varieties, which predominate in that section. Since tuber growth seems to be retarded by such high temperatures as occur during summer in Ohio and appear to depress potato yields there more than drought, for highest yields tuber development should proceed during cool weather as much as possible. This may be accomplished with the Rural varieties by planting at such a time that tubers develop during the cool fall weather and maturity coincides with the end of the growing season.

Field experiments during four seasons showed the highest yields to come from plantings made between May 13 and June 2. The Wooster records indicate that the average date of frost severe enough to kill potato tops is October 16. Plantings between May 15 and 25, adequately sprayed, will mature about October 16 and theoretically give the maximum average yields. General recommendations are to plant the last three weeks in May and follow by thorough spraying.

Since an unsprayed crop often dies prematurely from hopperburn, thus shortening the growing period, unsprayed potatoes should probably be planted

3 or 4 weeks later than sprayed crops. Several economic factors, particularly price at harvest, favor early April planting and at Wooster often outweigh the advantage in yield gained from May planting. Where the fall weather is more favorable for potatoes than at Wooster, early planting is less common.

Potato spraying and dusting experiments, 1921 to 1925, D. Folsom and R. Bonde (*Maine Sta. Bul. 334 (1926), pp. 205–284, pls. 8, figs. 2*).—Spraying and dusting experiments with potatoes from 1921 to 1925 are reported, with reviews of previous work in Maine and elsewhere and outlines of methods of spraying and dusting. Records available for the period 1892–1921 indicate that to attempt effective spraying against early blight and late blight, and incidentally flea beetles and leaf hoppers, would be justified if the estimated cost would be less than the increase in net returns expected from a fifth larger crop.

The accounts of the 1921–1925 tests also discuss the incidence of blight and flea beetle, the effectiveness of dusting, yields, and rot in subsequent storage of the crop. These tests considered with others carried on from 1916 to 1919 show an average increase of about 5 per cent over the 332 bu. produced by unsprayed potatoes in a healthy crop at digging, enough increase to justify spraying in 1926. Although Bordeaux spraying in many regions is usually profitable, this does not hold in all cases. In Aroostook County the several factors which generally tend to reduce profits indicate the desirability of more economical methods of spraying, on some farms at least.

The results from using a vine protector were not enough to seem significant under the conditions of field variations in the tests. The use of 5–50 copper sulfate solution to hasten maturity appeared to be an entire waste of effort and materials.

Comparison of copper lime dust and Bordeaux mixture during 4 years showed that, with equivalent amounts of metallic copper, dust is practically as good for controlling late blight, is markedly inferior for controlling flea beetles and early blight, and permits earlier maturity and about the same yield production even with some prematuring. The hopperburn question seemed irrelevant to the region. Dust was considerably more expensive due to the cost of factory mixed materials. The timeliness of applications and the human factor are also commented on in regard to dusting.

Proceedings of the twelfth annual meeting of The Potato Association of America (*Potato Assoc. Amer. Proc., 12 (1925), pp. 164, figs. 3*).—The twelfth annual meeting of the association held in Kansas City, Mo., in December, 1925, is reported on, and the activities of the organization and of its committees in 1925 are summarized. Among the papers included are The Development of Potato Varieties in the United States, by C. F. Clark; The Present Status of Potato Breeding, and Genetic Studies in Potatoes.—I, The Inheritance of Parti-Color and Suffused Tuber Color, both by F. A. Krantz; Relation of Environmental Factors to Productiveness of Seed Potatoes, by H. O. Werner; Northern Versus Southern Grown Seed, by W. H. Martin, W. M. Peacock, and P. M. Lombard; Some Problems of a Local Supply of Potatoes for the Cornbelt, and Some Suggestions from the Iowa Yield Tests of Seed Potatoes, both by C. L. Fitch; Some Studies in Hollow Heart of Potatoes, and Problems Confronting the Certification Authorities in the Great Lake States, both by H. C. Moore; Potatoes in Irrigated Rotation Experiments at the Scottsbluff, Nebraska, Experiment Farm, by J. A. Holden; Date of Planting a Factor in Size of Seed Piece Studies, by J. Bushnell; Time of Irrigation an Important Factor in Potato Production, by W. C. Edmundson; The Value of the Seed Source or Sample Plot in Certification of Potatoes, by M. F. Barrus; Methods

by D. Folsom and E. S. Schultz; Administration of Seed Potato Certification, by A. G. Tolaas; Problems Confronting the Certification Authorities in Canada, by D. J. MacLeod; Factors Influencing Certification Work in the Great Plains States, by H. O. Werner and W. Morrow; Problems Confronting Certification Authorities in the Inter-Mountain States, by F. M. Harrington; Problems Confronting Seed Potato Certification Authorities in the Pacific States, by J. E. Curry; The Hot Formaldehyde Dip of Seed Potatoes, by I. E. Melhus; Missouri's Adoption of the Hot Formaldehyde Method on a Commercial and Community Scale, by E. M. Page; Disinfecting Seed Potatoes by the Dry Method, by W. H. Martin; Some Experiments on the Control of Potato Scab (*Actinomyces scabies*) with Semesan and Other Organic Mercury Compounds, by F. J. Funk and J. H. Gooding; The Relation of Some Soil Factors to the Development of Common Scab of Potatoes, by G. B. Sanford; and Methods of Treating Seed Potatoes, by B. Ball.

The germination of lowland rice [trans. title], I. SUZUTA (*Abs. in Japan. Jour. Bot., 3 (1926), No. 2, pp. (38), (39)*).—Hulled and unhulled rice subjected to temperatures of from 30 to 100° C. for from 1- to 5-day periods did not show a subsequent reduction in germination for temperatures up to 80°. At 90° coagulation of the protoplasm was apparent. Rapid germination follows a more or less prolonged after-ripening period, which may be shortened by storage in direct sunlight, artificial heating, or by the use of hydrogen peroxide.

The date of seeding winter rye when the ground is dry or wet, A. N. HUME, E. W. HARDIES, and C. FRANZKE (*South Dakota Sta. Bul. 220 (1926), pp. 4*).—Substantial acreages of winter rye are sown in South Dakota each year, it being a comparatively sure crop and capable of producing fair yields when seeded over a wide range of time and conditions. Seeding tests at the Highmore Substation indicated that ordinarily maximum yields can be obtained from seeding the optimum date, September 15. In seasons with abnormally high or low rainfall, delaying seeding for some weeks after September 15 until conditions are favorable seems advisable. Such delay to avoid possible loss of valuable seed appears warranted by fairly good yields had from later seeding.

Tobacco from Palestine, Nigeria, and Mauritius (*Bul. Imp. Inst. [London], 24 (1926), No. 2, pp. 187–205*).—The merits of samples of Turkish tobacco from Palestine, pipe tobacco from Nigeria, and cigar filler tobaccos from Mauritius are pointed out, with brief comment on the status of the crop in these colonies.

The relation of the yield and protein content of wheat to the nitrogen content of the soil under ten years of different systems of cropping, H. E. NEIDIG and R. S. SNYDER (*Idaho Sta. Research Bul. 5 (1926), pp. 3–32, fig. 1*).—In reporting the progress during the period 1914–1923 of work outlined heretofore (E. S. R., 43, p. 227) the authors discuss the effect of the several rotations upon the wheat yield, the protein content of wheat, and the nitrogen content of the soil. Conclusions held applicable to the section of the Palouse country receiving an average annual rainfall of about 22 in., may be summarized as follows:

Continuous cropping of soil to wheat for 10 years without manure showed yields fluctuating from year to year, annual precipitation, especially that falling in May, June, and July, being a material factor in such variation. Continuous cropping to wheat with 20 tons of manure per acre applied every third year resulted in increased yields from year to year, with only a slightly higher protein content. After 10 years the nitrogen-carbon ratio was higher in the continuous plats manured than in unmanured.

The rotation wheat, oats, and corn drew heaviest on the soil nitrogen and carbon and was followed by (1) wheat, oats, and peas, and (2) wheat, oats, and potatoes. The last rotation affected the total nitrogen of the soil less than others including intertilled crops, and slightly exceeded the wheat, oats, and fallow rotation in average wheat yields. The wheat, oats, and pea rotation produced more wheat and with a lower protein content than the wheat, oats, and corn.

The corn and pea rotations receiving manure made a large increase in wheat yields with higher protein contents, while the wheat, oats, and fallow system showed high wheat yields and high protein content without manure applications. Manure increased the protein content materially and the yield only slightly, indicating that the best utilization of manure was not had on summer fallow under the experimental conditions. While plant foods, especially nitrogen, are made more available and larger crop yields result, nutrients and organic matter are more rapidly depleted by summer fallowing, and the poor physical condition of the soil resulting ends in greater erosion. The legume used in the rotations did not suffice to maintain the nitrogen and organic content of the soil.

The decreasing amounts of total nitrogen for the years 1920, 1922, and 1923 indicated that none of these rotations will maintain the nitrogen and organic content of the soil. Additional proof appeared in the narrow nitrogen-carbon ratio, which lies between 1:9.3 and 1:10.9. The fact that all applications of manure resulted in higher yields of wheat and in higher protein content is held to show that the protein content of wheat is influenced by manure. The results obtained seemed to indicate the close correlation of moisture and available plant foods, chiefly nitrogen, and their effect on the yield and protein content of wheat.

Varying characteristics of three types of wheat grown under the influence of identical environment, R. S. Herman (*Cereal Chem., 3 (1926), No. 4, pp. 244–252, figs. 6*).—Samples of Kharkof, Blackhull, and Kanred wheats from plats at the Kansas Experiment Station varied only slightly in milling qualities, while they differed widely in baking characteristics, and analytical variations were decidedly evident as regards ash and protein content, absorption, pH, and viscosity measurements. The unusually high protein content of Kanred and Blackhull gave no indication of fermentation period or possible margin of safety as relating to commercial usage of the flours. The three wheats gave practically identical baking results, with the exception of crumb color and absorption, when handled on their individual approximate optimum fermentation period.

The commercial protein test on wheat and some of its problems, W. O. Whitcomb and J. P. Lewis (*Cereal Chem., 3 (1926), No. 4, pp. 232–243*).—This contribution from the Montana Experiment Station deals with the history of the commercial protein test on wheat and some of the problems encountered in its application.

HORTICULTURE

[Horticultural investigations at the Arkansas Station] (*Arkansas Sta. Bul. 215 (1926), pp. 42–49, 52, figs. 3*).—As in the preceding annual report (E. S. R., 55, p. 36) the pollination of the apple is discussed. Following a brief review of methods of technique employed it is reported that Rome, Delicious, and Yellow Transparent pollen proved good and Ben Davis and Stayman Winesap pollen inferior for fertilizing Ben Davis flowers. In similar environment pollen which made the most vigorous growth was the most effective. Where one

flower in a cluster was pollinated considerably in advance the others often dropped even though fertilized. The unfavorable results with Ben Davis pollen are thought due to incompatibility, since the pollen grew well on media. Pollen kept dry in the laboratory germinated well for from 20 to 25 days. Arkansas and Stayman Winesap pollen was short-lived, while that of Rome, Ingram, and Delicious survived 41 days. In the presence of moisture pollen germinated rapidly. Up to 22–27° C. there was an increase in germination and growth of pollen tubes, with a slight reduction at 30° and considerable reduction at 35°. The optimum temperature for Yellow Transparent was about 24°, Delicious 18–24, King David 20, Arkansas 24–30, Stayman Winesap 24–27, and Ben Davis 22°, indicating a greater adaptability of certain varieties to southern temperatures. The bursting of pollen grains and the disintegration of tubes proceeded more rapidly at high temperatures.

Above 15 per cent, sugar decreased pollen germination and tube elongation. Germination is deemed largely a matter of moisture absorption. Pollen viability appeared to be affected by the vigor of the tree and of the spur rather than by any treatment the tree may receive. Sterility in the Winesap group is due to abortion of pollen grains and of ovules.

Measurements showed a greater average length in the case of Yellow Transparent and of Ben Davis for fruiting than for nonfruiting spurs. However, no definite standards of length and diameter could be associated with fruitfulness nor could any differences be correlated with fertilizer treatments. There was found in Ben Davis and Yellow Transparent an association between fruiting spur and terminal shoot growth, and generally spurs under 1 cm. in length were nonfruitful. Approximately 21 per cent of Yellow Transparent and 37 per cent of Ben Davis spurs bloomed in two successive seasons. A striking correlation was found between the number of apples remaining on the spur until the third week in June and the number of primary leaves on the spur. However, with new leaves the results were conflicting. That only a very small number of apples abscise on account of lack of fertilization was indicated in an examination of dropped fruits. Frequently, as in the Winesap group, fertilization is apparently prevented by ovule abortion as well as a failure of the pollen. Later dropping is considered largely a matter of competition between fruits.

Fertilizer studies with apples further emphasized the fact that nitrogen is the only element to effect appreciable results. It is believed that trees making from 6 to 8 in. terminal growth need no fertilizer, and the lack of water or humus may easily become a limiting factor.

Fertilizer studies with the peach are again discussed (E. S. R., 55, p. 341).

Fertilizers did not increase the yield of grapes. Pruning decreased the yield of grape vines in direct proportion to the amount of fruiting wood removed. Vines with 65 buds gave better yields than those reduced to 50. Fertilizers had no effect on the sugar content of grapes. Cynthiana gave promise as a stock for Campbell Early. A study of clusters borne on shoots arising from primary and secondary buds showed more and more and larger clusters from the primary buds but with no significant gain in size of individual berries.

A comparison of hotbed and outdoor-grown tomato plants gave results greatly in favor of the former.

[Horticultural investigations at the Delaware Station] (*Delaware Sta. Bul. 147 (1926), pp. 22–26, 27–29*).—This is the usual annual report (E. S. R., 54, p. 641).

As reported by C. A. McCue and L. R. Detjen long-continued studies show

Nitrogen was apparently the most important limiting factor, as trees receiving potash and phosphorous alone showed marked deterioration. That nitrogen is essential to peaches was indicated in observations recorded by G. F. Gray, McCue, and Detjen.

Cabbage breeding studies reported by Detjen and Gray showed the difficulty of isolating fixed types by self-pollination. The first generation plants resulting from reciprocal crosses of dissimilar parents were similar. Tall plants crossed with dwarfs yielded all tall progeny. Wide plants crossed with narrow ones yielded for the most part wide progeny. Large diameter of stem appeared also to be a dominant character. Crosses between head and loose-leaf types yielded all gradations, with headless types in the approximate ratio of 3 to 1 to heads. Bolting by nonbolting plants also yielded an intergrading progeny. The factor for blooming the first season appeared dominant to nonblooming. Bolting and heading appeared to be affected by a multiple factor for season. The time of maturity of cabbage seemed to be a complex character determined by a multiple factor. Various conditions of self and cross incompatibility are recorded and classified.

Observations by F. S. Lagassé upon the effect of 5 and 10 lb. applications of nitrate of soda to 20-year-old Paragon apple trees showed an increased growth and color with 10-lb. applications without any inhibiting effect upon fruit bud formation. In propagation studies with Stayman Winesap apples Lagassé found that scion wood taken from 2-year-old trees gave somewhat better survival than that taken from 1-year trees. Three-in. scions were slightly better than those 2 in. in length. The Crimson Beauty apple was largely self-sterile. The set of fruit in a solid block of Early Ripe apples was greatly increased by the introduction of bees and flowers of Yellow Transparent. Preliminary observations on the J. H. Hale peach showed this variety to be self-sterile, but when crossed with Belle of Georgia, Hiley, Early Elberta, and Elberta yielded 31.4, 23.9, 15.9, and 15.6 per cent of set, respectively.

[Horticultural investigations at the Illinois Station] (*Illinois Sta. Rpt. 1926, pp. 137–142, 144, 145, 150–160, 162, 164–166, 166–168, figs. 6*).—This is the usual annual report (E. S. R., 56, p. 233).

Apple breeding studies conducted by C. S. Crandall have yielded approximately 30,000 hybrid seedlings, the fruits of 4,600 of which have been described. Self-pollination studies have been seriously handicapped by self-sterility and a lack of vigor in such seedlings as have been produced. Disbudding of young apple trees to prevent the growth of undesirable limbs or summer tipping to check growth was found by W. A. Ruth and V. W. Kelley to check the development of the trees. On the other hand early summer tipping of the central leader encouraged the early formation of sufficient framework branches.

In studies at Olney, Ruth found nitrogenous fertilizers applied in the spring over a period of 3 years to be of little importance to Grimes and Jonathan trees of early bearing age. At Urbana, Ruth found the yield of mature Jonathan and Grimes trees was not reduced by severe dormant pruning in the two preceding seasons. Reduced number of fruits is compensated in the case of Jonathan by larger size. A high correlation was noted between bloom and crop in Grimes (the off year) and a low correlation in Jonathan (the on year). In a study by Ruth and Kelley of the effect of various types of pruning upon young apple trees, unpruned Duchess trees yielded the most fruit, followed in order by moderate thining, moderately headed and thinned, and with heavily thinned the least productive.

Studies by J. W. Lloyd and H. M. Newell of the apple situation in Calhoun County, in which area approximately half the commercial apple crop of Illinois is produced in spite of a total absence of railroads, showed that much of the fruit is not properly graded, with the result that prices are forced down. Peach breeding studies conducted by Crandall have resulted in several thousand seedlings, 238 of which are still continued under test as promising.

Small fruit tests conducted by A. S. Colby show the Quillen black raspberry, Van Fleet red raspberry, Wilder currant, and Glendale gooseberry to be promising on account of vigor. In storage at 35 to 40° F. Brighton grapes kept 153 and Delaware 141 days. Other good keepers were Barry, Diamond, Herbert, Caco, Agawam, and Vergennes. Chasselas Rose and Sweetwater, vinifera varieties, did well when accorded winter protection. Based on 3 years' records, vines trained according to the Kniffin system yielded the most clusters of maximum size when left with 45 to 50 buds to the vine. The results of a comparison of the Kniffin, Munson, Fan, and Chautauqua systems of training is given in tabular form. A study of the accumulative effect of 3 years' pruning upon the 1925 crop showed that when the number of buds is increased the number of pounds of fruit per vine increases up to a certain unestablished point. The rate of increase after 45 buds is reached becomes much slower. The greater the number of buds per vine the less the weight of individual clusters, particularly after 50 buds are reached. Worden and Moore Early were comparably productive whether trained to a single, a Y, or a double trunk. In the abnormally dry season of 1925 strawberry yields were increased more than 300 per cent by overhead irrigation. Selected strains of Juneberry and Elaeagnus were found to have value both as food and ornamental plants.

Vegetable fertility investigations conducted by Lloyd show that commercial fertilizers supplemented with cover crops are sufficient to produce satisfactory tomato yields except in very dry seasons, at which time manure proved a much better source of humus. Maximum yields of tomatoes and sweet corn were secured with manure supplemented by phosphorus or phosphorus plus potash. In 1925 the best yield of muskmelons was obtained with manure and phosphorus. Fertilizer tests were seriously hampered in 1925 by the early summer drought, but studies by Lloyd and E. P. Lewis in Cook County showed the value of phosphorus for truck crops. In some instances commercial fertilizers gave results comparable to those from manure. Apparently the amount of manure used by commercial growers could be greatly reduced if supplemented by commercial fertilizers. Of various manure substitutes a 4-8-6 fertilizer was most effective. Of single elements, acid phosphate gave the best results. Raw rock phosphate was decidedly less effective than either acid phosphate or bone meal.

Experiments by W. A. Huelsen and M. C. Gillis with sweet corn have resulted in selected strains of Country Gentleman and Evergreen possessing valuable canning qualities. Pure line studies with corn have reached the recombination stage. Sweet corn fertilizer tests reported in tabular form indicate that a combination of 400 lbs. of acid phosphate and 50 lbs. of muriate of potash is a particularly effective application. Huelsen and Gillis found that wilt-resistant tomatoes are far more productive than ordinary canning varieties when grown on infected soil. Selection studies indicated that resistance can be increased in practically all the main crop varieties by continued selection.

Studies by F. F. Weinard and S. W. Hall again showed the superior value of fresh soil in greenhouse flower production. Two-year grafted roses in new soil yielded 12 per cent more blossoms than comparable plants grown for two successive seasons in the same soil. Carnations produced approximately 8 per

cent more bloom in new soil. Whereas grafted Premier rose plants in new soil outyielded those in old soil, own-rooted plants were equal in productivity. Observations upon the behavior of gladiolus corms which had been used for forcing indicated that these may be successfully forced a second time. In the case of Ophelia roses slight gains in yield of blossoms were recorded in favor of the progeny of high-yielding plants. Orchid seedlings were grown successfully on agar media containing nutrient minerals and sugars.

Research in vegetable gardening, H. C. THOMPSON (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 287–295*).—This, the presidential address of the 1925 meeting of the American Society for Horticultural Science, outlines various important groups of vegetable problems whose solution is essential to the industry, discusses methods of attacking problems, and urges concentration on research having a practical as well as a purely scientific value.

Nitrate utilization by asparagus in the absence of light, G. T. NIGHTINGALE and L. G. SCHERMERHORN (*Science, 64 (1926), No. 1655, p. 282*).—Microchemical determinations at the New Jersey Experiment Stations in the winter and spring of 1926 upon asparagus growing in complete nutrient cultures and subject to continuous darkness consistently showed an abundance of nitrates in the fibrous absorbing roots, with none or very slight amounts in the storage roots. In continued darkness, the rapidly growing spears or shoots contained no nitrates save occasional traces near the bases. No nitrates were found in rapidly growing spears of plants grown under normal light conditions. In the case of plants growing in a minus nitrogen solution, no nitrates were found in any part of the plants. In the minus nitrogen series growth was associated with a decrease of protein and an increase of the nitrate-free soluble nitrogen fraction.

Analysis of the roots of the several series showed a considerable loss of carbohydrates associated with the growth of the spears. In continuous darkness this loss was much larger in the complete than in the minus nitrogen series, leading the authors to suggest that carbohydrates were used in the assimilation of the nitrates.

Government inspection of nurseries to eliminate variety mixtures, W. H. UPSHALL (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 276–283*).—Investigations conducted at the Horticultural Experiment Station, Vineland, Ont., showed that pears, plums, cherries, and peaches, as well as apples, may be identified by a careful study of various leaf and shoot characters. In the summer of 1925 over 850,000 trees were inspected, with an average percentage of mixture of only 1.5.

Notes on hardy orchard cover crops, R. J. BARNETT (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 283–286*).—In tests conducted at the Kansas Experiment Station, rye and winter vetch proved more valuable orchard cover crops than wheat, soy beans, cowpeas, or alfalfa. Observations indicated that the time of planting should be varied from season to season according to rainfall conditions. Winter vetch seeded at the rate of 40 lbs. per acre yielded more dry matter than when sown at the rate of either 20 or 30 lbs. Leguminous cover crops left the soil in a better physical condition than did cereal crops.

The nitrogen and carbohydrate composition of the developing flowers and young fruits of the apple, F. S. HOWLETT (*New York Cornell Sta. Mem. 99 (1926), pp. 3–79, figs. 20*).—A fuller report upon studies which have been previously discussed (E. S. R., 50, p. 835). Chemical analyses of apple flowers in various stages of development showed the total nitrogen in young emerging blossoms to be low on the basis of the average number of milligrams per flower but relatively high on the basis of the percentage of green and of dry weight.

a condition due, in the author's belief, to the large proportion of meristematic tissue in the young flowers. On the basis of percentage of green and dry weight, the flowers at the same stage as above were low in free reducing substances, total sugars, and the acid-hydrolyzable fraction, but with the approach of full bloom the flowers increased very greatly in all types of carbohydrates.

At full bloom the petals, comprising little more than one-third of the green weight of the entire blossom, contained approximately two-thirds of the free reducing substances. The rapid growth and enlargement of the petals was accompanied by a decrease of total nitrogen on the basis of the percentage of green and of dry weight. There was relatively little withdrawal of nitrogen and carbohydrates by the flowers during the period of full bloom.

The rapidly enlarging fruits that set withdrew progressively greater amounts of total nitrogen and of carbohydrates. Flowers that were about to drop showed decided losses of nitrogen after petal fall, comparable to the losses that occur in abscising leaves. The decrease, consistently ranging from 28 to 49 per cent of the entire amount present in the flower just after petals had fallen, is thought to be quite possibly due to a backward translocation. A decrease in various types of carbohydrates in the abscising flowers is deemed due to a change into an undetermined form, to increased respiration, or to a backward translocation.

Picking maturity of apples in relation to storage, J. R. MAGNESS, H. C. DIEHL, and M. H. HALLER (*U. S. Dept. Agr. Bul. 1448 (1926), pp. 20, pl. 1, fig. 1*).—This paper, taken in large part from an earlier and more comprehensive discussion (E. S. R., 55, p. 538), is devoted principally to the changes occurring in various important commercial apple varieties just prior to their ripening on the tree and during storage. It is emphasized that firmness of the flesh, the amount of yellowing on unblushed portions of the surface, and the tenacity with which fruits hold to the tree are in many instances the most dependable indexes to picking maturity. A color chart is presented for determining the rate of yellowing in the uncolored portion of the apple surface, and mention is again made (E. S. R., 54, p. 39) of the pressure tester designed by the Department for determining changes in resistance of the flesh.

Use of plant characters in identification of red raspberry varieties, J. D. WINTER (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 261–264*).—Studies conducted by the Minnesota Experiment Station during the growing season upon plants of a large number of raspberry varieties showed that certain plant characters, such as the abundance, color, and structure of the spines on the canes and on the petioles, the number of leaflets to each petiole, the relative height of the canes and whether or not they are conspicuously glaucous, and the color of the foliage are relatively constant under varying conditions of growth and may be used in the identification of varieties. A key is presented for important Minnesota varieties based upon these characters.

Experiments with fertilizers for coffee in Porto Rico, T. B. MCCLELLAND (*Porto Rico Sta. Bul. 31 (1926), pp. 34, pls. 3, figs. 18*).—Records taken upon the growth and yield of coffee shrubs fertilized with nitrogen, phosphorus, and potash, singly and in various combinations, showed potash to be distinctly beneficial, especially when combined with nitrogen. On the other hand, heavy applications of nitrogen alone or nitrogen combined with phosphorus had in this test a distinctly deleterious effect upon growth and yield. An examination by J. O. Carrero of the changes occuring in the soil solutions of the various plats showed the most productive plat, nitrogen and potash, to be the highest in acidity, indicating that coffee is an acid tolerant plant.

On another location complete fertilizers were most effective in increasing coffee yields, indicating that nitrogen, phosphorus, and potash all were of benefit. Observations upon the berries from the various plats showed that notable increases in yield were accompanied by a reduction in size of the berries.

In both field and pot tests ammonium sulfate applied semiannually proved more effective than sodium nitrate in increasing both growth and yield of Bourbon coffee. Heavy applications of lime failed to exert any appreciable effect on coffee yields. In pot experiments equal quantities of sodium nitrate were much more effective when applied monthly rather than in large semi-annual doses. Monthly applications of sodium nitrate supplemented with sulfur proved superior to semiannual applications of ammonium sulfate.

General suggestions for fertilizing coffee are presented.

Trees and shrubs of California gardens, C. F. SAUNDERS (*New York: Robert M. McBride & Co., 1926, pp. XIV+323, pls. 33*).—This book contains popular information concerning the history, culture, and attractive characteristics of native and exotic trees, shrubs, and vines of California.

FORESTRY

Some soil and moisture relationships of sweet gum and river birch in southern Maryland, F. B. TRENK (*Iowa Acad. Sci. Proc., 32 (1925), pp. 133–142, figs. 3*).—Noting the frequent existence in southern Maryland of adjacent but sharply demarcated stands of sweet gum and river birch, a study was made of the soil and moisture relations in the contrasting areas to determine, if possible, the underlying differences. In every instance the water-holding capacity of the sweet gum soils, both surface and substratum, exceeded that of the river birch.

The occurrence of hickories in Iowa in relation to soil types, F. B. TRENK (*Iowa Acad. Sci. Proc., 32 (1925), pp. 143–155, figs. 7*).—A study of the relation between the distribution of hickories and the character of the soil show that only a relatively small number of the 115 recognized soil types of Iowa support a growth of hickory.

Mixed white pine and hardwood, A. C. CLINE and C. R. LOCKARD (*Harvard Forest Bul. 8 (1925), pp. 67, figs. 13*).—Noting that the original forests of central New England were largely a mixture of hard and soft woods and also that pure stands of white pine have a tendency to revert to hardwoods, a study was made of various forest types in north central Massachusetts and southwestern New Hampshire to determine the best methods of handling the existing forests.

It was found that in second growth stands pine suffers severely in competition with sprout hardwoods, but that the few pines which attain maturity are of exceptional quality, suggesting the desirability of selective cutting which would favor both pines and hardwoods. The problem is chiefly confined to soils of medium quality, as these are better adapted than are heavier or lighter types to the pine-hardwood mixture. The pine was observed to thrive better when planted in small groups distributed among the hardwoods than as individual trees. With this plan the pines and hardwoods can be allowed to develop according to their own habits, without the necessity of liberation cuttings except perhaps along the marginal zone.

A study of possible returns from the different types leads to the assumption that greater net profits may result from mixed stands than from pure pine. Furthermore, the mixed stand is more natural and has a tendency to maintain

wind storms, insect scourges, etc. As the region studied is naturally adapted to hardwoods, it is deemed much wiser to supplement the hardwoods with groups of pine rather than to work against nature.

Germination of some pines and other trees, L. H. PAMMEL and C. M. KING (*Iowa Acad. Sci. Proc., 32 (1925), pp. 123–132, figs. 15*).—This comprises brief technical descriptions of the newly-germinated seedlings of several species of Pinus, Larix, Picea, and Sequoia.

Scotch pine pollen in Copenhagen, May 25, 1804 [trans. title], A. OPPERMANN (*Tharandter Forstl. Jahrb., 77 (1926), No. 12, pp. 404–408*).—Mention is made of a heavy fall of rain mixed with a yellow dust which under the microscope proved to be Scotch-pine pollen, a fact which was all the more astonishing since the nearest large Scotch-pine forests were more than 184 miles distant.

Douglas fir in Poland [trans. title], S. SUCHOCKI (*Rocz. Nauk Rolnicz. i Leśnych, 15 (1926), No. 1, pp. 150–205, figs. 13; Ger. abs., pp. 202–204*).—Of two types of Douglas fir introduced into Poland from North America the green Coastal form has been found much superior to the blue Colorado because of its greater frost resistance and more rapid growth, and on account of its tolerance to shade was found favorable for planting in older stands. As compared with the other conifers it was found to be less exacting on the soil. Preferably, the soil should be better than that required for Scotch pine but not necessarily equal to that preferred by oak. The site should be as free as possible from early and late killing frosts. Growth and volume tables are included.

DISEASES OF PLANTS

Plant diseases (*Arkansas Sta. Bul. 215 (1926), pp. 52–59, figs. 4*).—In continuation of work previously reported on the development of wilt resistant strains of cotton (E. S. R., 55, p. 41), tests were made of a large number of strains and varieties of cotton grown in heavily infested soil, but very little wilt resulted. In seeking for a possible explanation of the lack of wilting, physiological studies were made of the parasite, and it was found that in cultures in the absence of organic nitrogen the fungus was able to produce at least two substances which were toxic to cotton, while in the presence of organic nitrogen either no toxic substances were produced or they were in such dilution as to exert no injurious effect. The breeding work of the station is said to have shown marked differences in types of cotton in reference to their susceptibility to wilt. In connection with the plant breeding experiments, delinting the seed with sulfuric acid proved a good means of controlling angular leaf spot.

Using soil temperature control tanks, it was found that cotton wilt develops to only a slight extent at temperatures above 35° C., and it is believed that it will not develop to any appreciable extent below 25°. The optimum for growth is considered probably about 27 or 28°.

A summary account is given of investigations on a bacterial stalk rot of corn in continuation of work previously reported (E. S. R., 55, p. 847).

Stem rot of rice, due to *Sclerotium oryzae*, is said to have become one of the principal limiting factors in rice production in some parts of Arkansas. Rotation with some cultivated dry-land crop and the prevention of spreading the disease by straw, etc., or by drainage or overflow waters are suggested as means to be adopted for the control of this disease.

Apple spraying experiments are briefly reported upon which are said to indicate the need for more definite information on the relation of environ-

A brief account is given of sweet potato mosaic, a more detailed description of which has been noted (E. S. R., 56, p. 51).

Notes are given on the morphology and life cycles of a number of species of bacteria.

Department of plant pathology, T. F. MANNS and J. F. ADAMS (*Delaware Sta. Bul. 147 (1926), pp. 29–35*).—Laboratory studies have again indicated that sweet potato pox is caused by a species of Actinomyces.

Studies made on the possibility of insect carriers of the virus of yellows or little peach have given negative results with the peach curculio. Spring and fall dormant applications of fungicides failed to control the bacterial leaf spot of peach, and summer spraying gave little difference in leaf infection. Bagging experiments with Elberta and Hale varieties gave no indication of the possibilities of bud infection. Special attention was given to the problem of the overwintering of the disease, and a heavy twig infection of the Elberta variety is said to have materially assisted in this study. Peach twigs, the 1925 growth, were collected on October 29, 1925, and March 24, 1926, and plum twigs on February 5, 1926. From these twigs conclusive evidence was found that the organism overwinters in cankers. As a means of control toxicity studies were made to determine whether paradichlorobenzene and carbon tetrachloride, sodium fluoride, calcium fluoride, cresol, and chlorophenol mercury would destroy the bacteria. From the preliminary results field experiments were undertaken in which sodium fluoride, cresol, and chlorophenol mercury were given further test.

In tests for the control of diseases of cucurbits, two commercial dusts and two other copper preparations were tested, comparisons being made of 15 and 9 per cent copper dusts. Downy mildew did not appear, but leaf-blight infection was heavy on the untreated vines. All four dusts gave equally good control for leaf blight. Laboratory studies on cantaloupe diseases are said to have shown that *Alternaria brassicae nigrescens* was not associated with the leaf blight in the experiments described.

In the study of soy bean diseases there is said to have been shown a general increase in the State of leaf spot caused by *Septoria glycines*. Downy mildew and bacterial leaf spot (*Bacterium phaseoli sojense*) were not of common occurrence, and negative results were obtained in treating seed with chlorophenol mercury as no disease appeared on any of the plantings. A collection of seed made from plants showing mosiac when planted in the greenhouse in the fall showed no evidence of the disease symptoms on the foliage. It is thought probable that what had been considered mosiac was associated with a deficiency in potash. A spot disease due to *B. vignae* was reported in the State for the first time on Lima beans, and the same organism has been recognized as occurring on cowpeas.

In an experiment to control die-back on apples a natural mulch of pine needles and an unperforated thermogen paper were employed to cover the ground about the trees. When examined at later periods no die-back symptoms were observed, while in unmulched trees symptoms were conspicuous by the last of July.

In continuation of a study of the longevity of corn root diseases (E. S. R., 52, p. 844), additional tests of samples of the crop of 1922 have shown the persistence of *Diplodia zeae*, while *Gibberella saubinetii*, *Fusarium moniliforme*, and *Cephalosporium sacchari* showed a conspicuous dropping off in vitality.

[Plant disease investigations at the Illinois Station] (*Illinois Sta. Rpt. 1926, pp. 38–42, 143, 144, 147–149, 155, 168, fig. 1*).—Continuing investigations of

the middle of May, is best when diseased seed is used, but with disease-free seed planting a week earlier is advised. Studies by E. E. DeTurk, E. G. Sieveking, and J. R. Holbert are said to show that the protein reserve in seed corn infected with Diplodia is inadequate to carry over the plant through the germination and early seedling stages in the absence of other sources of nitrogen. The complete withdrawal of phosphate had little or no effect on the early growth of the corn seedling. Koehler et al. found that four commercial compounds were of some value in combating Diplodia and Gibberella root rot diseases, but the common methods of seed treatment were of no value.

Investigations of H. W. Anderson on fire blight have been extended to include a study of the hold-over blight cankers on the apple variety Willow Twig and have resulted in the recommendation of definite control measures. These include cutting out the cankers, disinfecting and protecting the wounded surfaces, inspection of orchards, and immediate removal of new infections.

Studies by the same investigator are said to show that lime sulfur of dormant strength applied in the fall or Bordeaux mixture oil emulsion applied in the fall or early spring will control peach leaf curl. If applied in the spring after the buds swell neither will control the disease, nor will oil emulsion applied in the fall or spring.

The black root rot of orchard trees caused by *Xylaria* sp. is said to be increasing in Illinois, and this fungus is believed to be a common cause of the dying of young trees in the southern part of the State. A type of root rot associated with weakness in the graft is briefly described. Root or collar rot of apple trees caused by the fire blight organism is reported.

Continued studies by A. S. Colby are said to have shown that two seasonal applications of lime sulfur controlled gooseberry leaf spot when conditions were not favorable for the spread of the disease.

Experiments of F. F. Weinard and S. W. Decker showed that neither seed nor seed-bed treatments controlled aster yellows after the plants were transferred to the field.

Economic plant diseases common in Kansas and their control, L. E. Melchers (*Kansas Sta. Circ. 129 (1926), pp. 23*).—In tabular form descriptions are given of the more striking characteristics of many of the diseases occurring on economic plants in Kansas, and suggestions are offered for their control or prevention. In a separate part of the publication seed treatments for the control of seed-borne diseases are described, and formulas and directions are given for the preparation of various sprays and other fungicides.

Destruction of insect and fungus or fungoid pests, A. H. Benson (*Queensland Agr. Jour., 24 (1925), No. 5, pp. 465–467, fig. 1*).—A comparison is made of methods for control of pests and diseases affecting various agricultural plants.

Metabolism in Botrytis, A. Hunter and G. H. Berkeley (*Abs. in Phytopathology, 14 (1924), No. 7, p. 349*).—A study of the metabolism of four Botrytis forms of the *B. cinerea* group was made by analyzing for total nitrogen, ammonia nitrogen, amino nitrogen, sugar content, and titratable acidity of the medium, along with total nitrogen and dry weight values of the mycelium. The results are said to show important and interesting aspects of metabolism, and to indicate that two of the four forms are closely related and comprise a group distinct from the other forms. A correlation between physiology and morphology, in so far as grouping of the forms was concerned, was established.

Mosaic studies, IV, B. T. Dickson (*Abs. in Phytopathology, 14 (1924), No. 7, p. 346*).—Mosaic of *Pisum sativum* is said to be transmitted through seed. Soy bean mosaic is reported for the first time in Quebec, also a case of transmis-

A transmission of mosaic from *Physalis* sp. to *Browallia* sp. is said to have occurred under uncontrolled conditions.

Effects of salt and hydrogen-ion concentration upon the growth and structure of certain bacteria and moulds, G. B. Reed (*Abs. in Phytopathology, 14 (1924), No. 7, p. 348*).—The growth of *Vibrio comma* in dilute peptone is said to be increased with the addition of sodium chloride up to 0.2 M. The addition of the salt widens the pH tolerance, and further increase in the concentration of salt is said to decrease the growth and to decrease the pH tolerance. The optimum growth of *Oidium lactis* was similarly influenced by salt concentration and pH value.

Equipment and methods for studying the relation of soil temperature to diseases in plants, R. W. Leukel (*Phytopathology, 14 (1924), No. 8, pp. 384-397, figs. 5*).—A detailed description is given of the equipment, together with the operation and methods employed, for the study of the relation of soil temperature to cereal diseases at the Arlington Experimental Farm.

Simultaneous surveys for stem rust: A method of locating sources of inoculum, E. M. Freeman and L. W. Melander (*Phytopathology, 14 (1924), No. 8, pp. 359–362, fig. 1*).—The authors describe a method for the location of barberry bushes that have escaped detection in surveys for their eradication.

Seed treatment for smut control, W. P. Fraser and P. M. Simmonds (*Abs. in Phytopathology, 14 (1924), No. 7, p. 347*).—Experiments on smut control with wheat and hull-less oats were carried on at the Dominion Experimental Farms in Saskatchewan and Alberta, in which copper carbonate, a mixture of copper sulfate and calcium carbonate, and sulfur in the form of dusts, and also solutions of formaldehyde, Semesan, and Chlorophol gave good control except in the case of sulfur in some experiments. Copper carbonate dust was most satisfactory for hull-less oats.

Experiments in oat smut control in 1923, J. E. Howitt and R. E. Stone (*Abs. in Phytopathology, 14 (1924), No. 7, p. 346*).—Formaldehyde sprinkle treatment is said to have reduced both germination and yield, while formaldehyde spray almost entirely prevented smut and was followed by the largest yield of any of the methods tested. Neither copper carbonate dust nor copper sulfate-lime dust was effective in eliminating smut. Copper sulfate dip reduced germination slightly but was effective in the control of smut.

Smut control experiments in hull-less oats during 1923, B. T. Dickson, R. Summerby, and J. G. Coulson (*Abs. in Phytopathology, 14 (1924), No. 7, p. 350*).—Formalin, copper sulfate, copper carbonate, and copper sulfate-lime dust were tested for the control of smut. While all greatly reduced the percentage of smut, copper carbonate proved the most efficient method of control and the most simple in its application.

Pickling wheat with carbonate of copper, H. C. Quodling (*Queensland Agr. Jour., 24 (1925), No. 5, pp. 456, 457, fig. 1*).—The advantages and method are outlined of applying copper carbonate to wheat seed to prevent stinking smut, as are also directions for constructing conveniently and inexpensively the petrol case seed pickler."

"Take-all" of wheat in western Canada, W. P. Fraser (*Abs. in Phytopathology, 14 (1924), No. 7, p. 347*).—The occurrence of *Ophiobolus cariceti* on Marquis wheat in northern Saskatchewan is reported.

Sclerotinia intermedia n. sp., a cause of decay of salsify and carrots, G. B. Ramsey (*Phytopathology, 14 (1924), No. 7, pp. 323–327, pl. 1, figs. 6*).—A description is given of a strain of Sclerotinia found causing decay of the roots of salsify and carrots on the Chicago market. The sclerotia are said to be intermediate in size between those produced by *S. libertiana* and *S. minor*,

and an intermediate amount of mycelium is produced. Hence the descriptive name *S. intermedia* is proposed for this species.

A native weed host for bacterial blight of bean, M. W. GARDNER (*Phytopathology, 14 (1924), No. 7, p. 341*).—The author reports *Bacterium phaseoli* occurring in leaf lesions on *Strophostyles helvola*, a common weed plant in many regions.

Bacterial rot of cauliflower [trans. title], GÉRAY (*Jour. Agr. Prat., n. ser., 44 (1925), No. 51, pp. 501, 502*).—Cauliflower culture has suffered severe losses during the previous 20 years owing to a rot due to a bacterium said to have been described by Delacroix (E. S. R., 17, p. 876) and Griffon. Varieties indicated as having abundant water are more susceptible than are less watery kinds, which are less desirable. Apparently soil alkalinity is favorable to the disease.

Cotton diseases in Porto Rico [trans. title], M. T. COOK (*Rev. Agr. Puerto Rico, 15 (1925), No. 6, pp. 300, 301*).—Cotton disease-causing fungi named include *Cercospora gossypina*, *Ramularia areola*, *Kuehneola gossypii*, *Glomerella gossypii*, *Diplodia gossypina*, *Sclerotium rolfsii*, and one or two species of Fusarium.

Studies on a leaf spot of Phaseolus aureus new to the Philippine Islands, C. G. WELLES (*Phytopathology, 14 (1924), No. 8, pp. 351–358, pl. 1, figs. 3*).—A leaf, stem, and pod disease of mungo bean (*P. aureus*) is described, the causal organism being *Cercospora cruenta*.

White rot of Allium in Europe and America, J. C. WALKER (*Phytopathology, 14 (1924), No. 7, pp. 315–322, pl. 1; abs. in same, No. 1, p. 26*).—An account is given of an investigation of the white rot of onion caused by *Sclerotium cepivorum*, the presence of which in this country had been recently reported. The fungus is known to affect common onion, Welsh onion, leek, shallot, and garlic, and the causal organism is believed to overwinter and persist indefinitely in the soil under European conditions.

Observations made in Europe and laboratory experiments by the author are said to indicate the disease to be most destructive in moderately cool soil (15 to 18° C.) having a medium moisture content. These conditions are said to prevail for the winter crop of onions in the Southern States, and this region is considered favorable for the disease. The chief mode of widespread dissemination of the fungus is on diseased bulbs or seedlings.

Root rot and blight of canning peas, R. E. STONE (*Abs. in Phytopathology, 14 (1924), No. 7, pp. 348, 349*).—It is claimed that in certain sections of Ontario root rot and blight cause serious loss to canning peas. Two fungi have been found closely associated with the disease, one a species of Fusarium and the other a Pythium. Attempts have been made to secure disease-resistant strains of peas, and several strains have been developed that appear promising.

The relative efficiency of some copper dusts and sprays in the control of potato diseases and insect pests, O. C. BOYD (*New York Cornell Sta. Bul. 451 (1926), pp. 3–68, figs. 8*).—A report is given of an investigation made to compare certain dusts and sprays, particularly copper-lime dust with Bordeaux mixture, for the control of potato diseases and insect pests, especially late blight and flea beetle control.

Laboratory experiments are said to show that the membranes formed when copper-lime dust is wetted are similar to those in Bordeaux mixtures rich in lime, but they remain entire and are not broken and scattered as in the spray. When light applications were made of copper-lime dust and of dilute Bordeaux mixture to give the same amount of copper per unit of area, a larger percentage

of this area was covered by the spray membranes, due to their greater number and greater surface area, than by the dust membranes.

Under field conditions, it was found that about 44 per cent more copper for each unit amount applied per acre was retained by the foliage sprayed with Bordeaux mixture than by the dusted foliage, and laboratory experiments showed that the spray coating was more resistant to washings than copper-lime dust coverings. Under both greenhouse and field conditions only about one-half as much dust was retained by dry potato foliage as by thoroughly moistened leaves, and under field conditions the rate of loss from the dry-dusted foliage was higher. When equal amounts of copper were applied to damp foliage, in the copper-lime dust with a good hand machine or the best power dusters and in the Bordeaux mixture with exceptionally good sprayers, the control of early and late blight and of aphids appeared to be about equal in the two methods. The spray coating appeared to be superior in the control of flea beetles, leafhoppers, and tipburn. Copper-lime dust when applied to dry foliage was less effective in controlling diseases and insect pests than when applied at the same rate to damp foliage.

The results of three years' experimentation in the comparison of copper-lime dust with Bordeaux mixture are said to show that the sprayed plats produced an average gain in yield over the dusted plats of 7.2 bu. per acre, and this is considered indicative of the difference between the effectiveness of the two methods of protection. Sulfur, used either alone or with hydrated lime, gave only slight protective properties against late blight, flea beetles, and tipburn. When freshly mixed copper-lime dusts containing from 10 to 20 per cent of copper were applied to wet foliage, a slight burning of the leaves followed the use of the 10 per cent dust and a severe injury from the 20 per cent mixture. Dusts which contained less than 10 per cent of metallic copper produced no injury.

Some evidence was obtained which is believed to indicate that heavy coatings of either dust or spray produced a dwarfing or a stunting effect on the plants, and this was entirely independent of the occurrence of copper injury on the leaflets. Based on the price of dusting and spraying materials in 1922, when 3 lbs. of copper was applied per acre in each application, it is said that it cost about $2 to dust an acre once with home-mixed copper-lime dusts, $1.50 to spray an acre once, and from $3.75 to $4 to treat an acre once with commercial brands of dust.

Results of experiments to prevent potato Rhizoctonia, J. E. Howitt (*Abs. in Phytopathology, 14 (1924), No. 7, p. 349*).—Five years' experiments on the control of Rhizoctonia have indicated that in Ontario corrosive sublimate materially reduces the amount of Rhizoctonia, and that stronger solutions than those usually recommended can be used.

Potato varieties resistant to wart disease [trans. title], H. L. De Vilmorin (*Jour. Agr. Prat., n. ser., 44 (1925), Nos. 49, pp. 453, 454; 50, pp. 475–478; 51, pp. 493–496*).—Information is given regarding potatoes resistant to wart disease, more particularly English and German varieties.

Witches' broom of potatoes in the Northwest, C. W. Hungerford and B. F. Dana (*Phytopathology, 14 (1924), No. 8, pp. 372–383, pl. 1, figs. 4*).—A description is given of a potato disease that made its appearance in the Pacific Northwest in 1923. The disease is said to have occurred under a wide range of conditions, and while the cause was not definitely determined the infection was found to be constantly transmitted by the tubers. Witches' broom of potatoes is said to have some resemblances to leaf roll, spindle sprout, and net-necrosis, but from the evidence at hand the authors consider it a distinct

Sugar production and cane diseases [trans. title], M. T. Cook (*Rev. Agr. Puerto Rico, 15 (1925), No. 6, pp. 273–276*).—A brief discussion relative to sugar cane diseases affecting production, and to preventives, including disease-free stock and ground, roguing, and immune or highly resistant varieties.

Cane pests and diseases, W. Cottrell-Dormer (*Queensland Agr. Jour., 24 (1925), No. 5, pp. 441–443*).—Leaf scald is the most serious cane disease of the Mossman district, Clark Seedling appearing very susceptible. Leaf stripe injured greatly ratoon B. 147, but was resisted by Q. 813. Foot rot is favored by too early covering. Leaf scald shows varietal preferences.

Rust resistance in timothy, H. D. Barker and H. K. Hayes (*Phytopathology, 14 (1924), No. 8, pp. 363–371, fig. 1*).—Previous investigations having indicated that certain timothy selections were quite resistant to rust (E. S. R., 42, p. 247), further selections were made of various clonal lines which were inoculated with timothy rust from different localities in the United States and Canada. No definite indications were found showing the existence of biological strains of *Puccinia graminis phleipratensis*. The occurrence of resistant clonal lines of timothy which were not infected by the rust collected from widely separated localities is said to lend encouragement to the production of rust-resistant varieties. Inoculation experiments on seedlings produced from self-fertilized clonal lines, and from crosses between clonal lines, indicated that resistance or susceptibility in the selections of timothy studied is dependent upon a single differential factor pair. Resistance is said to be a dominant, and a close approximation to a 3:1 ratio was obtained in the progeny of self-fertilized resistant plants.

Tomato diseases, G. H. Berkeley (*Canada Dept. Agr. Bul. 51, n. ser. (1925), pp. 14, pls. 3*).—This is said to be a revised edition of Bulletin 35, second series, prepared by McCubbin and noted previously (E. S. R., 43, p. 348).

A study of the physiological drop of fruits in Delaware, L. R. Detjen and G. F. Gray (*Delaware Sta. Bul. 147 (1926), pp. 20, 21*).—In continuation of studies on the physiological drop of fruits (E. S. R., 55, p. 451), a brief account is given of studies on the correlation existing between the time and mode of shedding of fruits and the genetic relation of the trees. It was found that trees of the same variety under similar conditions shed their immature fruits in similar and parallel waves, while trees of different varieties and different kinds of fruits shed their fruits in dissimilar waves. Strong evidence is said to have been secured that indicates the stability of the wave character in relation to the variety or kind of fruit. Neither widely different fertilizer treatments, crown gall disease, rootstocks, nor early or late applications of nitrogen disturb the balance of the genetic factor.

Sphaeropsis malorum and Myxosporium corticola on apple and pear in Oregon, S. M. Zeller (*Phytopathology, 14 (1924), No. 7, pp. 329–333*).—The author confirms the statement of Stillinger relative to the occurrence of apple black rot in Oregon (E. S. R., 46, p. 849), but the disease is considered of limited economic importance because of the dry summer climate. The fungus has usually been found as a bark canker, although it is said to occur also as a leaf spot and may cause a black rot of apples rather frequently.

M. corticola is said to occur in Oregon as a superficial bark canker, and apparently it produces no lasting or damaging effect on trees which have bark infections due to this organism. No decay of fruit was induced by artificial inoculation.

Apple measles, with special reference to the comparative susceptibility and resistance of apple varieties to this disease in Missouri, A. S. Rhoads (*Phytopathology, 14 (1924), No. 7, pp. 289–314, pls. 5, fig. 1*).—The author

describes an obscure bark disease of apple trees, reviews the literature regarding this disease, and gives an account of his own investigations concerning it. Marked differences in the susceptibility and resistance of different varieties to measles are pointed out. Various explanations have been advanced to explain the cause of the disease, but the author found no relation between drainage of soil, application of fertilizers, tillage, and cover crops, or the method of pruning and the prevalence of the disease. Thus far no causal organism has been discovered, and the author believes that the trouble is purely a physiological one. From his observations of the disease in Missouri he does not consider it responsible for a more or less rapid decline of the tree. In many instances young and vigorous trees were found to outgrow the trouble ultimately without any special treatment.

Note on an Exoascus disease on Prunus amygdalus var. amara, W. G. Campbell (*Bot. Soc. Edinb. Trans. and Proc., 29 (1924–25), pt. 2, pp. 186–191, figs. 4*).—*P. amygdalus amara* in St. Andrews University Botanic Garden has for some years shown disease, which has recently spread to *P. amygdalus dulcis*. Dieback is a prominent feature, as is also an increase in all dimensions of the leaves, the average weight of which is about eleven times the normal. The fungus, which hibernates in the walls of the phloem elements of the shoots, is claimed to be other than the true *Exoascus deformans*, as it differs from that form in several details.

Raspberry diseases, G. H. Berkeley and A. B. Jackson (*Abs. in Phytopathology, 14 (1924), No. 7, p. 347*).—The authors report that the average amount of mosaic for the Niagara Peninsula is from 15 to 20 per cent. Nicotine sulfate may be used to check the spread of the disease, and heavy fertilizing tends to mask its presence. The chief method of control suggested is the use of certified stock. Leaf curl of raspberries in the Niagara Peninsula is said to vary from 0 to 5 per cent, and the disease is believed to be on the decrease.

A note on raspberry canker (Nectria rubi Osterwalder), N. L. Alcock (*Bot. Soc. Edinb. Trans. and Proc., 29 (1924–25), pt. 2, pp. 197, 198*).—At two points named raspberry cane roots showed disease in association with *N. rubi*.

Blue stem of red and black raspberry, G. H. Berkeley and A. B. Jackson (*Abs. in Phytopathology, 14 (1924), No. 7, pp. 347, 348*).—The presence of blue stem on black raspberries has been reported, and the authors give an account of the disease as prevalent throughout the Niagara Peninsula, Ontario, on both red and black raspberries. Isolations from the wood of infected canes are said to have given characteristic cultures of *Acrostalagmus caulophagus*.

Strawberry black root, G. H. Berkeley and A. B. Jackson (*Abs. in Phytopathology, 14 (1924), No. 7, p. 348*).—The presence of this disease in one or two districts of the Niagara Peninsula is reported. Preliminary inoculation tests are said to indicate that at least one type of injury may be caused by soil bacteria.

Bunchy top in bananas, E. J. Goddard, C. J. P. Magee, and H. Collard (*Queensland Agr. Jour., 24 (1925), No. 5, pp. 424–429*).—Tests in insect-proof inclosures showed 100 per cent infection within one month following contact of banana plants with insects (*Pentalonia nigronervosa*) from infected plants, but no infection in plants not exposed.

Pineapple chlorosis [trans. title], M. T. Cook (*Rev. Agr. Puerto Rico, 15 (1925), No. 6, pp. 296, 297*).—Pineapple chlorosis appears most frequently in the gravelly coastal soils of alkaline reaction between San Juan and Arecibo. Iron sulfate at different rates gives marked improvement in case of young plants.

The aecial stage of Hyalopsora aspidiotus, J. H. Faull and G. D. Darker

fern parasite, is said to have *Abies balsamea* for its alternate host, an observation which was confirmed by inoculation experiments of the authors.

Stereum sanguinolentum as the cause of "sapin rouge" or red heart rot of balsam, J. H. Faull and I. Mounce (*Abs. in Phytopathology, 14 (1924), No. 7, pp. 349, 350*).—A description is given of a rot of balsam trees due to *S. sanguinolentum*. The fungus is said to fruit abundantly on dead trees and slash, and on this account they should be destroyed.

The pathological anatomy of tissue produced in Abies balsamea following an attack of the spruce budworm, C. H. McLeod (*Abs. in Phytopathology, 14 (1924), No. 7, p. 345*).—A description is given of young shoots of *A. balsamea* attacked by the spruce or balsam bud worm. The abnormalities are said to appear in any part of the growth ring, and several types may appear in the same ring.

Chestnut blight in Ontario, R. E. Stone (*Abs. in Phytopathology, 14 (1924), No. 7, p. 345*).—Chestnut blight due to *Endothia parasitica* is said to occur in Ontario. In Norfolk County, 25 per cent of the trees are reported diseased.

Some silvicultural aspects of the chestnut blight situation, E. H. Frothingham (*Jour. Forestry, 22 (1924), No. 8, pp. 861–872*).—In this account with discussion (mainly from a silvicultural point of view) of chestnut blight, chiefly in the southern Appalachian region, it is concluded that efforts to stop or even control its spread are not justified by experience. Chestnut utilization is the first need. Successive short-lived generations of sprouts from blight-killed chestnuts, with the tendency of such to spread, also the reproduction of inferior species and shading, constitute a menace to the more valuable hardwoods.

Coryneum twig blight of Manitoba maple, J. E. Howitt (*Abs. in Phytopathology, 14 (1924), No. 7, p. 345*).—The Manitoba maples in the vicinity of the Ontario Agricultural College are reported as affected by *C. negundinis*.

The self pruning of western yellow pine, W. H. Long (*Phytopathology, 14 (1924), No. 7, pp. 336, 337*).—Attention is called to the presence of *Cenangium abietis* on the lower parts of the western yellow pine, where it causes self-pruning through its destruction of the lower branches. Only the lower weakened branches are attacked, the fungus rarely being found more than 30 ft. from the ground. It is considered a valuable asset to the lumbering industry in New Mexico and Arizona.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Animal pests of useful plants, I, H. Blunck, K. Friederichs, F. Stellwaag, S. Wilke, and F. Zacher, rev. by L. Reh (*Handbuch der Pflanzenkrankheiten*, founded by P. Sorauer. *IV, Tierische Schädlinge an Nutzpflanzen, 1. Teil. Berlin: Paul Parey, 1925, 4. ed., vol. 4, pp. XVI+483, figs. 218*).—In this volume the authors deal with the insect and other animal pests of economic plants.

Rabbit and mouse control in the orchard, T. J. Talbert (*Missouri Sta. Circ. 151 (1926), pp. 14, figs. 7*).—This includes an account of the treatment of injured trees.

Analysis of the growth curves of the insect larvae, N. Yagi (*Mem. Col. Agr., Kyoto Imp. Univ., No. 1 (1926), pp. 35, figs. 9*).—This is a contribution from the entomological laboratory of the Kyoto Imperial University.

Entomology [at the Arkansas Station] (*Arkansas Sta. Bul. 215 (1926), pp. 39–41, fig. 1*).—In reporting upon the boll weevil, reference is made to work previously reported in Bulletins 203 and 204 (E. S. R., 55, pp. 50, 55).

The insect injury to cotton which attracted most attention during 1926 was caused by three species of plant bugs, the cotton hopper, the tarnished plant

bug, and the cotton leaf bug. A survey made at representative points in the State at the height of the outbreak showed that the majority of all infestations of the cotton hopper could be traced to patches of croton or of evening primrose. These infestations were generally local, although in some instances they were spread over the greater part of large plantations. Dusting cotton with both sublimed and superfine sulfur gave fairly satisfactory control of the hopper in experimental plats, and was also apparently successful in large fields where used by the growers.

The codling moth life history studies were continued, and the rate of emergence of spring brood moths in 3-day periods, a hypothetical curve of rate of oviposition, and dates recommended for making cover sprays to control first brood larvae are graphically illustrated by a chart. In addition to the calyx spray, three cover sprays were recommended for the control of first brood larvae, and four were recommended for the control of the later broods.

"In the best plat 90.24 per cent of all fruit set was free from worms, in contrast with 10.87 per cent free from worms on the unsprayed check. An average of 2,024 apples, 94.79 per cent of which were free from worms, was harvested on each of the trees on this sprayed plat, while an average of only 152 apples was harvested on the check trees. Trees on which the last spray application was omitted were distinctly more wormy than trees given the full schedule, resulting on the average in a loss of nearly 8 per cent of the harvested fruit."

Brief reference is made to a 2-year study of the birds of the State.

[Investigations of economic insects], H. L. Dozier (*Delaware Sta. Bul. 147 (1926), pp. 17–20*).—The investigations of the year dealt particularly with the bionomics and control of the codling moth, its control in the State, due to "side worm" injury, being the outstanding problem in this field. An attempt was made to determine the degree of variety susceptibility to attack, and a distinct preference was found to be shown for the Stayman Winesap, Paragon, and King David. The Nero, Rome Beauty, Delicious, and York Imperial were attacked to a much less degree, and the Lily of Kent, Jonathan, and Missouri Pippin showed a decided resistance to attack, their fruit being almost uninjured while other varieties on adjacent and surrounding trees were badly damaged. It is pointed out that the degree to which a variety is attacked seems to be connected with the toughness of the skin.

A study was made of the various sources of infestation and carry-over of the pest, and it was clearly shown that old picking baskets in the packing houses and sheds were the greatest source. The old picking baskets were found to be heavily infested with worms, which, upon leaving the picked fruit, cocooned up in the crevices and between the staves. On May 5 several hundred worms were collected from baskets at a packing house, and up to this date only one individual had pupated. In the outdoor insectary at Newark, however, about 10 per cent of the worms in pupation sticks had pupated by May 7. The first adult moths began issuing in a packing house at Woodside on May 20, the majority of these being oriental peach moth adults at that time, and as the season advanced the numbers of the oriental peach moths decreased and the codling moth adults increased. In the cellar of one grower the moths started emerging in abundant numbers by June 10, and adults caught on Tanglefoot exposed the last 48 hours at the windows showed 535 oriental peach moths and 85 codling moth adults. On June 23 more Tanglefoot had caught 322 oriental peach moths and 142 codling moths; on July 1, 121 codling moths and 101 oriental peach moths; and on July 8, 253 codling moths and only 41 oriental peach moths. This shows the oriental

peach moth to be slightly earlier in spring emergence than the codling moth and also indicates a mixed infestation of both species on the apple. Some interesting data were obtained on the abundance of wasp parasites of the codling moth, the following species having been taken in the packing house in order of their abundance: *Ascogaster carpocapsae* (Vier.), *Phanerotoma tibialis* Hald., *Bracon carpocapsae* (Cush.), and *Dibrachys boucheanus* (Ratz.).

From 389 old picking baskets stored in the cellar of a packing house at Camden in the early spring, 11,602 worms were found, an average of 29.08 worms per basket. Out of approximately 3,000 baskets at Woodside, 224 showed 4,895 worms, or an average of 21.4 worms per basket. One hundred baskets in the cellar of a grower at Rising Sun gave 1,373 worms, or an average of 13.73 worms per basket.

In a large cage in an orchard near Camden, the first stung fruit of the season was observed on June 7, and by June 10 only 35 out of 94 set fruit on the tree were unstung, some of the young apples having as many as 6 or 7 stings. On June 24 a careful examination of this orchard showed stung fruit outside the cage to be extremely scarce, while in the cage all the fruit was heavily stung, some having as many as 27 stings. It was stated that instead of entering through the calyx cup end of the fruit, as usually occurs, the newly hatched worms entered from the side, and it was rare to find an attempt at entry through the calyx.

The grape leafhopper has for a number of years taken a heavy annual toll in the vineyards of the State, and, gradually increasing in numbers, has proved to be the worst grape pest in the State. A study has been made of its life history in the outdoor insectary, with seasonal observations of conditions in the field. The fungus *Entomophthora sphaerosperma* was observed to be killing large numbers of adults on grape foliage in the fall of 1925, and during the latter part of May, 1926, they were as abundant as in the preceding July. Liquid nicotine did not prove very successful against the adults, and strong winds in the vineyards rendered dusting impracticable. Calcium cyanide dust was demonstrated to have better killing powers than the nicotine lime dust, but on the few hot, quiet days that occurred some growers used 2 per cent nicotine lime dust with good practical results at a cost of about $5 per acre.

[Insect control investigations at the Illinois Station] (*Illinois Sta. Rpt. 1926, pp. 163, 164*).—In control work by J. W. Lloyd and W. P. Flint with insects on eggplants, the best yields in 1925 were obtained from plants dusted with arsenate of lead (1 lb.) and hydrated lime (4 lbs.) Spraying with calcium arsenate (1.5 lbs.) and lime (1 lb. to 50 gal. water) resulted in nearly as high yields. The results of the year indicated that the arsenical is the active agent in the control since the spraying material, consisting of calcium arsenate and lime alone, was more effective than the combined mixture of Bordeaux and arsenate; and the weaker the Bordeaux the greater was the yield of eggplants.

In control work with the striped cucumber beetle, the best results were obtained by dusting plants with a mixture consisting of 1 lb. of calcium arsenate and 20 lbs. of gypsum. The yield from the plats so treated was 4 times the average yield of all untreated check plats and was higher than the yields resulting from any of the other treatments.

The biological control of insect pests and injurious plants in the Hawaiian Islands, A. D. Imms (*Ann. Appl. Biol., 13 (1926), No. 3, pp. 402–423, pl. 1*).—This is a summary of information based upon investigations in the islands in 1925.

(Annual reports of the entomologist for the years 1924 and 1925], E. JARVIS (*Queensland Bur. Sugar Expt. Stas. Ann. Rpts., 24 (1924), pp. 13–18; 25 (1925), pp. 17–23*).—These are the usual annual reports (E. S. R., 52, p. 853). They deal with work with sugar-cane insects, particular attention being given to the control of the gray-back cockchafer (*Lepidoderma albohirtum* Waterh.), including the use of paradichlorobenzene, calcium cyanide, and carbon disulfide; the weevil borer *Rhabdocnemis obscurus* Boisd.; and the termite *Mastotermes darwiniensis* Frogg.

Catalogue of Indian insects, IV–X (*Calcutta: Govt., 1924, pts. 4, pp. 33; 5, pp. IV+40; 1925, pts. 6, pp. 126; 7, pp. 29; 8, pp. 35; 9, pp. 92; 1926, pt. 10, pp. 14*).—This is in continuation of the catalogue previously noted (E. S. R., 51, p. 54). Part 4, by R. Senior-White, deals with Trypetidae (Trypaneidae); part 5, by S. N. Chatterjee, with Nitidulidae; part 6, by M. Cameron, with Staphylinidae; parts 7, 8, and 9, all by T. B. Fletcher, with Lasiocampidae, Amatidae, and Zygaenidae, respectively; and part 10, by G. R. Dutt, with Stephanidae. Systematic arrangements of the genera and species, bibliographies, and distributional data are given for each family.

The utilization of calcium cyanide in the control of insect and rodent pests in India, W. H. BRITTAIN (*Planters' Chron., 21 (1926), No. 33, pp. 538–544*).—The author concludes that calcium cyanide has a wide range of usefulness as an insecticide and rodent killer in India. It is easily transported, simply and quickly applied, requires no mixing, and after exposure the poisonous property disappears leaving a nonpoisonous residue.

Calcium cyanide and its utilization in the control of insect pests in Ceylon, W. H. BRITTAIN (*Trop. Agr. [Ceylon], 67 (1926), No. 1, pp. 45–49, pl. 1*).—A discussion of the use of this insecticide as applied to pest control in Ceylon.

Studies on contact insecticides.—Part IV, A quantitative examination of the toxicity of certain plants and plant products to Aphis rumicis L. (the bean aphis), F. TATTERSFIELD, C. T. GIMINGHAM, and H. M. MORRIS (*Ann. Appl. Biol., 13 (1926), No. 3, pp. 424–445, figs. 6*).—The authors here continue earlier work (E. S. R., 55, p. 852), with an account of laboratory experiments on the toxicity to *A. rumicis* of extracts of a considerable number of plants, including some tropical fish poisons, lupines, broom, gorse, lobelia, and others.

"Alcoholic extracts of certain tropical plants used as fish poisons are shown to have a high toxicity under the conditions of the experiments. The roots and stems of white haiari and the stems of black haiari (both species of Lonchocarpus from British Guiana), the roots of *Tephrosia toxicaria*, and the leaves of *T. vogelii* all possess notable insecticidal properties. The roots and stems of *T. candida* are less toxic. Preliminary experiments indicate that the haiaris and *T. vogelii* and *T. toxicaria*, when tested as stomach poisons, exert both a repellent and toxic action to caterpillars. Certain derivatives isolated from these plants were tested. The most toxic substance obtained from the haiaris is shown to be identical with tubatoxin, the crystalline poison found in *Derris elliptica*. Tubatoxin proved to be several times more toxic than nicotine. In the case of *T. vogelii* and *T. toxicaria*, the most toxic substances isolated were resinous in nature. Crystals closely corresponding to tephrosin, as isolated by Hanriot, were less toxic. A number of alkaloids were also investigated. Cytisine and lobeline, known to have a physiological action on higher animals similar to that of nicotine, were found somewhat less toxic than nicotine to aphides. Eserine was the only other alkaloid tested which approached nicotine

A quantitative examination of the toxicity of 3:5-dinitro-o-cresol and other compounds to insect eggs under laboratory and field conditions, C. T. GIMINGHAM, A. M. MASSEE, and F. TATTERSFIELD (*Ann. Appl. Biol., 13 (1926), No. 3, pp. 446–465, pl. 1, figs. 2*).—In this special paper on the subject (see above) the authors report upon quantitative determinations, under controlled conditions in the laboratory, of the toxicity of 3:5-dinitro-o-cresol and its sodium salt to eggs of the geometrid moth *Selenia tetralunaria* Hüfn.

The results show that these compounds have a very high toxicity to insect eggs, and that the sodium salt of dinitro-o-cresol is only slightly less toxic than dinitro-o-cresol in the uncombined state. Preliminary laboratory experiments indicate that dinitro-o-cresol is also highly toxic to insect eggs of a more resistant type than those of *S. tetralunaria*. Spray fluids containing dinitro-o-cresol or the sodium salt showed a high efficiency against eggs of the hop aphid on plum trees on a larger scale under field conditions. The trees sprayed with these compounds remained almost free from aphids during the following spring when the control trees were badly infested. The spray fluids containing dinitro-o-cresol and its sodium salt had a marked general cleansing effect on the trees. No injury to the trees was observed.

A quantitative method for judging the results of the field experiments was worked out. This involved recording details of large numbers of eggs on selected shoots on sprayed and control trees before and after spraying, a numerical measure of the effect of the various treatments being thus obtained. The method gave consistent and reliable results.

Fruit insect problems for 1925, E. N. CORY (*Peninsula Hort. Soc. [Del.] Trans., 39 (1925), pp. 34–38*).—This is a brief discussion of the more important insect enemies of fruit in the year, particularly relating to the oriental peach moth.

The control of the Porto Rican mole-cricket, or changa, on golf courses, W. A. THOMAS (*Bul. U. S. Golf Assoc. Green Sect., 6 (1926), No. 9, pp. 197–200, figs. 2*).—It is pointed out that many complaints have been received from golf clubs in the southeastern United States, the West Indies, and even from South America relating to the destruction wrought to greens and fairways by the changa. In experiments conducted at the Jekyl Island Club, of Brunswick, Ga., it was found that a commercial product, a carbon disulfide emulsion containing 75 per cent of carbon disulfide, used at the rate of 1 part of the emulsion to 400 parts of water and sprinkled over the green at the rate of 2 qt. to the square foot of area as rapidly as the ground would absorb it, resulted in a control of slightly more than 95 per cent. In the course of from four to six weeks the infestation was sufficiently heavy to justify an additional treatment.

Thirty lbs. of a commercial cyanide dust, which contained approximately 40 per cent actual calcium cyanide, was mixed with 500 gal. of water and poured as evenly as possible over the entire green (about 4,400 sq. ft.) through a 0.75-in. hose. While applying the solution it was kept thoroughly agitated, and after the application sprinklers were set running to carry the material into the soil. This treatment also gave more than 95 per cent control, but like the emulsion its effects lasted for only about a month.

It was found that three applications of a poison bait consisting of 100 lbs. of cottonseed meal, 100 lbs. of rice flour, and 10 lbs. of calcium arsenate, moistened with a cheap molasses solution (1 part of molasses to 10 parts of water) to make the bait crumbly, gave excellent control. The bait was used at the rate of 15 lbs. to the green, or 150 lbs. per acre, at weekly or 10-day intervals. Although the effect was not as immediate as with the carbon disulfide and calcium cyanide treatments, the low cost of the material and

the ease of application made it practicable to treat not only the green but also the adjacent infested fairways, thus preventing early reinfestation of the green. Late afternoon was found to be the most satisfactory time for making treatments.

The influence of temperature on the maturation and general health of Locusta migratoria L., V. P. Pospelov (*Bul. Ent. Research, 16 (1926), No. 4, pp. 363–367, pls. 3*).—This is a contribution from the State Institute of Experimental Agronomy, Leningrad.

Observations on the life history of Helopeltis on cotton in Southern Nigeria, O. B. Lean (*Bul. Ent. Research, 16 (1926), No. 4, pp. 319–324*).—The life history, habits, and control of the capsids *H. bergrothi* Reut. and *H. sanguineus* Popp. are considered.

Controlling mealybugs on ornamental plants, R. W. Doane (*Pan-Pacific Ent., 2 (1926), No. 4, pp. 213, 214*).—In control work with the common mealybug, *Pseudococcus gahani*, the author has found a spray consisting of 1 gal. Volk oil (orange oil), 7.5 lbs. Gold Dust washing powder, 0.5 pint nicotine (Blackleaf 40), and 50 gal. of water to be effective.

The silver fir chermes, R. N. Chrystal (*[Gt. Brit.] Forestry Comn. Bul. 7 (1926), pp. 27, pls. 9*).—This bulletin gives a general account of the chief species of silver fir used for forest planting in Britain, including a discussion of *Abies grandis* and *A. nobilis* in relation to chermes attack. This is followed by accounts of the silver fir chermes *Dreyfusia nüsslini* Bör. and *D. piceae* Bör. and their relation to the forest, the silver fir in Denmark, the silver fir chermes in Denmark, and the control of chermes in Denmark, and a general discussion of the Danish results in relation to British conditions.

The development of the ovary in the silkworm (Bombyx mori), J. Machida (*Jour. Col. Agr., Imp. Univ. Tokyo, 7 (1926), No. 4, pp. 293–351, pls. 4, figs. 2*).—This report of the author's studies includes 64 references to the literature.

Results of the sixth year's work against the gipsy moth in New Jersey, H. B. Weiss et al. (*N. J. Dept. Agr. Circ. 105 (1926), pp. 32, figs. 28*).—Details of the work of the year (E. S. R., 54, p. 156) are presented, largely in tabular form. But three colonies, containing a total of 54 egg masses, were found.

The potato tuber moth, E. N. Cory (*Peninsula Hort. Soc. [Del.] Trans., 39 (1925), pp. 51–56*).—A brief discussion of the status of the potato tuber worm and means for its control (E. S. R., 55, p. 356).

A study on the biology of the green bud worm (Argyroploce variegana Hb.) and the eye-spotted budmoth [trans. title], J. Wobroniecka (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Pulawach (Mém. Inst. Natl. Polon. Écon. Rurale Pulawy), 6 (1925), A, pp. 366–394, pl. 1; Eng. abs., pp. 390–394*).—Of a large number of tortricids injurious to orchards in the environs of Pulawy and in all the district of Lublin, *A. variegana* and the eye-spotted budmoth are said to do the most damage. In this paper the author deals with their biology, natural enemies, and means of control.

The peach tree borer, J. O. Pepper (*Clemson Agr. Col. S. C., Ext. Circ. 81 (1926), pp. 8, figs. 10*).—A practical account of this pest and means of control.

Theresia ampelophaga Bayle in Crimean vineyards, S. M. Fedorov (*Bul. Ent. Research, 16 (1926), No. 4, pp. 393–397, pls. 2*).—An account of the distribution and ecology, bionomics, nature of the damage, and control measures for this lepidopteran, one of the most important pests of the vine in various countries.

The European corn borer: The relation of the larvae to submergence, M. F. Crowell (*New Hampshire Sta. Tech. Bul. 30 (1926), pp. 20, figs. 7*).—In

of 1924–25 and continued until the spring of 1926. He discusses resistance of larvae to submergence, the structure of the spiracles, closing apparatus, tracheal system, penetration of liquids into the tracheal system, etc.

It was found that the hibernating larvae of the European corn borer can withstand periods of submergence in water from six to seven times as long as can the active larvae. This ability appears to be due to the fact that the tracheal closing apparatus is closed during the period of hibernation, since there is no other anatomical adaptation to account for it. Their ability to withstand submergence is not sufficient to account for the records of survival after prolonged submergence in the stalks in which they enter hibernation, but this survival may be accounted for by the fact that a considerable time elapses before a submerged stalk becomes saturated with water. A comparison of this pest with others shows that the hibernating larvae of other Lepidoptera can also withstand longer periods of submergence than can the active larvae.

Notes on the sweet potato pyralid moth, Megastes grandalis Guen., J. W. Cowland (*Bul. Ent. Research, 16 (1926), No. 4, pp. 369–372, figs. 2*).—It is pointed out that since *M. grandalis* was first reported from Brazil in 1854 there has been no record until 1919, when it was reported by Urich from Trinidad. It is well distributed throughout the island, and during certain seasons is a very serious pest of the sweet potato, which is the only known food plant. The author gives descriptions of the immature stages, notes on its life history and habits and on its parasites, including the egg parasite *Trichogramma minutum* Ril., the sarcophagid larval parasite *Sarcophaga sternodonta* Towns., and the tachinid *Masicera? abdominalis* Wulp.

The European pine-shoot moth (Evetria buoliana Schiff.) [trans. title], W. Tempel (*Kranke Pflanze, 2 (1925), No. 8, pp. 166, 167, pl. 1; abs. in Rev. Appl. Ent., 13 (1925), Ser. A, No. 12, p. 603*).—In an old infestation of the pine-shoot moth near Chemnitz, Saxony, the author observed parasitism by the tachinid *Actia (Thryptocera) pilipennis* Fall., and the homenopterans *Pimpla examinator* F., *P. turionella* L., *P. detrita* Hb., *Cremastus confluens* Gr., and *Orgilus obscuratus* Hal.

On the development and biology of Simaethis (Hemerophila) pariana Clerck [trans. title], S. Minkiewicz (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Pulawach (Mém. Inst. Natl. Polon. Écon. Rurale Pulawy), 6 (1925), A, pp. 330–365, pls. 2; Eng. abs., pp. 357–364*).—This is a report of a pest which in 1920 emerged in large numbers and severely injured a young apple orchard of the National Institute of Agriculture in Pulawy. Studies of its life history and habits, natural enemies, and means of control are dealt with.

The larger narcissus bulb-fly, E. McDaniel (*Michigan Sta. Quart. Bul., 9 (1926), No. 2, pp. 54, 55*).—This is a brief account of the narcissus bulb fly, found during the year for the first time in Michigan bulbs. It includes a reference to the hot-water treatment for bulb flies and eelworms.

The Queensland fruit fly (Chaetodacus tryoni Froggatt), H. Jarvis (*Queensland Agr. Jour., 26 (1926), No. 2, pp. 101–104, pl. 1*).—A brief summarized account of this fruit fly, which was first discovered by Tryon in 1889.

North American cerambycid larvae, F. C. Craighead (*Canada Dept. Agr. Bul. 27, n. ser. (1923), pp. 239, pls. 44, figs. 8*).—This work deals with the classification and the biology of North American cerambycid larvae. The subject is dealt with under the headings of introduction (pp. 3, 4), classification of the larvae as correlated with that of the adults (pp. 5–7), biological characteristics as correlated with anatomical structures and their use in taxonomy (pp. 7–9), summary of biological habits (pp. 9–13), anatomical characterization (pp. 13–25), brief characterization of larvae of the family

Cerambycidae, including keys to the subfamilies, genera, species, etc. (pp. 26–138), appendix with additional species (pp. 138–144), literature cited (pp. 145, 146), index to species, genera, and higher groups (pp. 147–149), abbreviations used in plates and text figures (p. 150), and plates (pp. 151–239).

Notes on the coffee berry-borer (Stephanoderes hampei Ferr.) in Uganda, H. HARGREAVES (*Bul. Ent. Research, 16 (1926), No. 4, pp. 347–354, figs. 3*).—The author gives a summary of the life history of this borer and a description of the early stages, and discusses the habits of the adults, nature of the damage, natural control, and artificial control.

The tuart bud weevil (Haplonyx tibialis), L. J. NEWMAN and J. CLARK (*Aust. Forestry Jour., 9 (1926), No. 7, pp. 191, 192, 194, 195, figs. 4*).—An account of *H. tibialis* and its injury to the tuart (*Eucalyptus gomphocephala*), one of the most useful hardwoods grown in Western Australia.

Hymenoptera and paratyphoid? The intestinal bacteria of bees and wasps [trans. title], K. MÜLLER (*Centbl. Bakt. [etc.], 1. Abt., Orig., 97 (1926), No. 2–3, pp. 214–218*).—None of the 75 strains of Gram-negative bacteria obtained from bees and wasps and cultivated on Endo agar which resembled paratyphoid colonies was agglutinated by the typhoid or paratyphoid B serum. Reference is made to the investigations of Bahr (E. S. R., 47, p. 259) and others on the subject.

Studies of Bacillus larvae, the cause of American foulbrood of bees, A. G. LOCHHEAD (*Canada Expt. Farms, Div. Bact. Rpt. 1925, pp. 19, 20*).—The author has tabulated the growth of *B. larvae* on different media and also the effect of plant extracts on the growth of *B. larvae*.

Notes on encyrtidae (Hym., Chalcidoidea) bred from psyllids, with description of a new species, A. B. GAHAN and J. WATERSTON (*Bul. Ent. Research, 16 (1926), No. 4, pp. 373–375, fig 1*).—*Psyllaephagus arbuticola*, reared from a psyllid on Arbutus in San Mateo and Alameda Counties and from *Euphyllura arbuti* at Palo Alto, Calif., is described as new.

On a new trichogrammatid (Hym., Chalcidoidea) parasite of the cotton stemborer (Sphenoptera sp.), J. WATERSTON (*Bul. Ent. Research, 16 (1926), No. 4, pp. 309–313, figs. 2*).—Under the name *Lathromeris johnstoni* n. sp., the author describes and reports upon a new egg parasite of the cotton stem borer (*Sphenoptera* sp.). It has been reared from Khartum, Anglo-Egyptian Sudan, to 100 miles south.

Descriptions of new coccid-inhabiting chalcidoid parasites (Hymenoptera), H. COMPERE (*Calif. Univ. Pubs. Ent., 4 (1626), No. 1, pp. 31, figs. 10*).—In this paper eight parasites are described as new, including two aphelinids, one eulophid, three Ectromatini (encyrtids), and two Mirini.

The woolly aphis parasite (Aphelinus mali Hald.), W. B. GURNEY (*Agr. Gaz. N. S. Wales, 37 (1926), No. 8, pp. 620–626, figs. 3*).—This is an account of the introduction and establishment of *A. mali* in New South Wales.

The woolly aphis parasite (Aphelinus mali Hald.), H. JARVIS (*Queensland Agr. Jour., 26 (1926), No. 2, pp. 105–108, figs. 5*).—This is a brief summary of the life history of this parasite in Queensland.

British spiders: Their haunts and habits, T. H. SAVORY (*Oxford, Eng.: Clarendon Press, 1926, pp. XII+180, figs. 34*).—A small handbook on British spiders.

A new invertebrate host of Trypanosoma cruzi Chagas, C. URIBE (*Jour. Parasitol., 12 (1926), No. 4, pp. 213–215, fig. 1*).—The author reports the discovery that the reduviid bug *Apiomerus pilipes* Fab. is a host of *T. cruzi* in Venezuela. This bug was found to feed readily upon *Rhodnius prolixus* Stahl and also upon the house fly.

ANIMAL PRODUCTION

[The biological values of proteins] (*Illinois Sta. Rpt. 1926, p. 65*).—In continuing the studies of the biological values of proteins (E. S. R., 51, p. 570), H. H. Mitchell found that corn protein had an average value of 55 with swine as compared with an average value of 60 obtained in numerous experiments with rats. Tankage protein proved to have a distinctly inferior value of 48, 47, and 30 in individual experiments with swine as compared with the proteins of other feeds. In agreement with earlier work, mixtures of corn and tankage had an average value higher than that of corn alone.

Dietary requirements for reproduction (*Arkansas Sta. Bul. 215 (1926), pp. 23, 24, 25, figs. 4*).—In continuing this study (E. S. R., 54, p. 561), the potency of wheat oil as a source of vitamin E, both for fertility and lactation, has been demonstrated by use in connection with a skim milk powder sterility-producing ration.

Two types of sterility have been encountered, one form being observed in the first generation females, which is characterized by a resorption of the fetus, while the second form occurs in the second-generation animals receiving a diet of skim milk powder prepared from winter milk, and can be prevented by incorporating in the basal diet 3 per cent of wheat oil, and 0.05 per cent of equal amounts of $AlK(So_4)_2.12H_2O$, NaF, $MnSO_4$, and Na_2SiO_3. Illustrations of uteri containing resorbed young are presented.

An unusually high requirement of vitamin B for normal milk secretion has likewise been brought out in these studies.

Fowler's solution cuts size of rabbit litters (*Illinois Sta. Rpt. 1926, p. 82*).—In continuing the studies of the effect of Fowler's solution on reproduction in rabbits, E. Roberts and G. A. Lindsey found that the average size of 28 litters produced before treating the females with this substance was 6.3, while the average size of 34 litters produced after feeding Fowler's solution was 5.3. It was also further indicated that the animals to which this drug was administered were more susceptible to disease, and many were rendered sterile.

Effects of fluorine on bone formation (*Arkansas Sta. Bul. 215 (1926), pp. 23, 26, 27*).—Preliminary studies of the function of the inorganic elements of the diet have indicated that the utilization of calcium and phosphorus compounds is influenced by the relative amounts of vitamins and magnesium present, and by their state of division and degree of solubility.

Fluorine has been found to be a disturbing element in bone formation in the amounts which are present in rock phosphate. In excessive amounts it interferes particularly with calcium formation. In rats, fluorine, in amounts varying from 0.1 to 0.5 gm. per kilogram of the ration, has been found to produce a marked elongation of the upper incisors.

Tests show best type of corn to use for silage (*Illinois Sta. Rpt. 1926, pp. 90, 91*).—Studies by W. B. Nevens indicated that corn containing from 25 to 35 per cent dry matter at the time of harvest made silage having better keeping qualities and a higher feeding value than corn in which the dry matter content was without these limits. The digestion coefficients of one variety of early and two varieties of late maturing corn are presented for comparison.

Inspection of commercial feeding-stuffs, T. G. Phillips, T. O. Smith, and A. W. Petre (*New Hampshire Sta. Bul. 224 (1926), pp. 51*).—The usual report of the guaranties and analyses of feeding stuffs officially inspected between December, 1925, and May, 1926 (E. S. R., 54, p. 264).

Cattle feeding investigations, 1924–25, C. W. McCampbell, B. M. Anderson, and H. W. Marston (*Kansas Sta. Circ. 128 (1926), pp. 14, fig 1*).—An experiment with baby beef steers and two with yearling steers are reported.

To what extent may one depend upon silage as a roughage for baby beef?—Six lots of calves were selected for a 195-day experiment ended May 18, 1925. All lots were fed shelled corn. The roughage of one lot consisted of alfalfa hay, while another lot received cane silage as the only roughage. The other four lots received a full-feed of cane silage through the entire experiment, but during the last 75 and 135 days and for the entire feeding period, respectively, 2 lbs. of alfalfa hay per head daily were allowed. The fourth lot received a full-feed of alfalfa hay during the entire experiment. The rations were supplemented with cottonseed meal in amounts varying inversely with the amount of alfalfa hay fed.

The results showed that the inclusion of both cottonseed meal and cane silage in the ration of corn and alfalfa produced the best finish and the largest returns over feed costs. Gains were slightly more rapid on the rations of corn and unlimited amounts of alfalfa, with or without the cane silage. Fairly satisfactory baby beef was also produced on the ration of corn, cane silage, and cottonseed meal, but supplementing this ration with alfalfa hay throughout the feeding period materially increased the calculated value of the silage.

Cottonseed meal v. ground corn as a fattening feed.—Two lots of yearling steers, averaging approximately 550 lbs. in weight, were fed on a ration of alfalfa hay and silage plus cottonseed meal in one lot, while the other lot received 1 lb. of cottonseed meal per head daily and sufficient corn to make the combined amounts of concentrates in the two lots equal. For the 140-day feeding period the former consumed 11.04 lbs. of cottonseed meal per head daily, and the latter 10.04 lbs. of corn and 1 lb. of cottonseed meal. The average daily gains of the respective lots were 2.39 and 2.43 lbs., but the former lot was a little better finished. Ground corn fed in this way proved to be worth approximately 95 per cent as much as cottonseed meal, though its ordinary market price is relatively much below that proportion.

Wintering yearling steers preparatory to grazing without grain the first half of the grazing season and full feeding the last half.—Three lots of 10 yearling steers, averaging approximately 540 lbs. in weight, were selected for this test. Lots 1 and 2 were wintered on a limited grain ration, averaging 4.83 lbs. of corn and 1 lb. of cottonseed meal per head daily, with alfalfa hay and cane silage. Lot 3 received the same amounts of cane silage and cottonseed meal, but no corn or alfalfa. Following the winter feeding period, the three lots were grazed without grain from May 5 to August 3. After this pasturing period lot 1 was then finished by 90 days' feeding in dry lot on corn, cottonseed meal, and alfalfa, while the other two lots were finished with corn and cottonseed meal on pasture.

The results showed that the steers which were wintered without grain were fed at a considerable loss per head according to the calculated prices, but this loss was considerably reduced by the more rapid gains on pasture. When the finished period was included the calculated profits were greater than for the other lot finished on grass, but the returns were not as great as for those finished in dry lot.

Cattle feeding investigations, 1925–26, B. M. Anderson and H. W. Marston (*Kansas Sta. Circ. 130 (1926), pp. 5, fig 1*).—Six lots of calves, averaging approximately 420 lbs. in weight, were selected for studying the results which could be obtained with prairie hay when supplemented with cottonseed meal, linseed meal, or calcium carbonate, and fed with shelled corn

and cane silage. A control lot for comparison received a ration of shelled corn, cane silage, alfalfa hay, and cottonseed meal, which proved most satisfactory in the above experiments.

The results indicated that the addition of 0.11 lb. per head daily of calcium carbonate to a ration of shelled corn, cane silage, prairie hay, and cottonseed meal increased the rate of gain from 2.12 to 2.31 lbs. per head daily. When alfalfa hay replaced the prairie hay without calcium carbonate the rate of gain was 2.30 lbs. Another lot receiving the same ration, except that the corn was self-fed, made an average daily gain of 2.42 lbs. per head, and showed the largest calculated profits over feed costs of any of the lots. Linseed meal proved slightly superior to cottonseed meal as a supplement to the prairie-hay ration in the rate of gain, feed required per unit of gain, and finish of the steers. Feeding half alfalfa and half prairie hay did not give as good results as where prairie hay was fed alone and supplemented with calcium carbonate.

Economic beef production investigation (*Arkansas Sta. Bul. 215 (1926), pp. 29, 30*).—Calves from grade Angus cows bred to purebred Angus bulls weighed an average of 430.4 lbs. at weaning and 661.6 lbs. after 140 days' feeding on alfalfa, silage, brewers' rice, and cottonseed meal. Purebred Angus calves averaged 433.4 lbs. at weaning and 666.4 lbs. at the end of the experiment. The corresponding weights of calves from scrub cows sired by purebred bulls were 374.3 and 589 lbs., respectively, and for calves from scrub cows sired by scrub bulls 366.4 and 579.4 lbs., respectively.

The calves were rated as to quality in the order of purebreds, calves from scrub cows and purebred bulls, calves from grade cows and purebred bulls, and scrub calves whose sires and dams were scrub animals.

Wintering stock steers, E. L. Potter and R. Withycombe (*Oregon Sta. Bul. 224 (1926), pp. 16, figs. 13*).—From the results of 10 years' experiments in wintering 33 lots of calves and heifers at Eastern Oregon Substation (E. S. R., 55, p. 665), general suggestions for the wintering of stock steers are presented.

The studies have shown that calves in particular may gain in weight but at the same time lose in fat and relative finish when short of feed. The same is also true of yearlings but to a less extent, due to the decreased tendency of yearlings to grow as compared with calves. The gains made the following summer on pasture were found to be directly related to the winter gains, irrespective of the kinds of feeds used. Calves making average winter gains of 21, 63, 115, 162, and 187 lbs. made the following respective summer gains: 238, 247, 219, 195, and 182 lbs. Similar results were obtained in experiments with yearlings. The amount of feed required to produce an average daily gain of 2 lbs. per head was approximately twice that required for maintenance in both calves and yearlings.

In a discussion of the value of alfalfa, straw, silage, and grain for wintering stock cattle, it is pointed out that approximately 2 lbs. of alfalfa per 100 lbs. of live weight daily was required to maintain weight, while each additional 7 to 7.5 lbs. produced 1 lb. of gain. Straw appeared to have no place in the winter ration where any appreciable gain was expected, but for maintenance purposes 2,100 to 2,200 lbs. of barley straw supplemented with 165 lbs. of cottonseed cake or 650 lbs. of alfalfa was equivalent to 1 ton of alfalfa. Silage proved to have approximately 40 per cent the economic value of alfalfa pound for pound when included in an alfalfa hay ration for wintering stock. It is therefore recommended that silage be saved for fattening cattle, where its value has been estimated at approximately twice that for maintenance. Nor with its high cost and relatively low value for maintenance purposes, did it

appear to be advisable to include grain in the winter ration of steers that are to be turned out on grass.

Sweet clover fell short in 1925 as beef pasture (*Illinois Sta. Rpt. 1926, pp. 62, 63*).—In continuing the study of the maintenance of the breeding herd (E. S. R., 56, p. 262), H. P. Rusk found that the backward spring of 1925 greatly retarded the growth of sweet clover, making it necessary to add oat straw to the ration of cows carried through the grazing season on this pasture. By furnishing this supplement the length of the pasturage season was extended from 90 to 100 days, and the cows made an average daily gain of 0.38 lb. in weight as compared with a loss of 0.81 lb. when no oat straw supplement was furnished.

Data collected during the following winter indicated that dry stover silage was a satisfactory basal ration for dry beef cows during the winter months. When supplemented with 1 lb. of soy bean oil meal and 5 lbs. of oat straw the cows were maintained in a good breeding condition.

A mineral deficiency in the rations of cattle, C. H. Eckles, R. B. Becker, and L. S. Palmer (*Minnesota Sta. Bul. 229 (1926), pp. 4–49, figs. 18*).—A survey indicated that mineral deficiency in cattle was particularly prevalent in certain regions of Minnesota, and that the symptoms of depraved appetite, stiffness, and very soft bones were most pronounced in the late winter or early spring, and were least pronounced when the animals were on pasture, especially in wet seasons.

Analyses of timothy, alfalfa, and prairie hay grown in regions where mineral deficiency was observed indicated that the calcium and magnesium contents were fully equal to the normal, but the phosphorus content was lower. During two years in which the rainfall differed considerably, the mineral content of the forage appeared to be associated with the rainfall. The water in the affected regions was high in its content of magnesium and sulfates.

After making the survey, three experiments were conducted. The first was concerned with the prevention of depraved appetite by feeding bone meal on 6 different farms with 119 cattle. Access to bone meal was allowed during a 150-day period. The average consumption per 30-day period on these different farms varied from 1.92 to 8.24 lbs. per head, but salt was mixed with the bone meal on the farm where the very high consumption occurred, and the average consumption on the other 5 farms was 3.57 lbs. per head per month. No indications of depraved appetite were apparent in the herds receiving bone meal, the cattle were reported as in better condition, and less difficulty was experienced with breeding.

The second experiment was concerned with the wintering at the station of 6 cows from a section where depraved appetite was especially severe on a basal ration of prairie hay, ground oats, salt, and water to which magnesium sulfate was added. Two of the cows receiving the basal ration only showed depraved appetite in 186 and 194 days, respectively. Of the 2 receiving a supplement of 150 gm. of calcium carbonate daily, depraved appetite was evidenced in 1 in 118 days, while the other failed to show it, as did the other 2 which received 100 gm. of monobasic sodium phosphate per head daily. This experiment showed that symptoms similar to those occurring in affected areas, though less severe, were produced by the use of feeds from farms where mineral deficiency was prevalent. More liberal feeding probably reduced the severity of the symptoms.

The third experiment involved the effect of mineral supplements in curing 7 animals showing depraved appetite. Four individuals receiving 103 gm. of tricalcium phosphate or 128 gm. of monobasic sodium phosphate recovered

rapidly, as did one receiving tricalcium phosphate and 85 gm. of magnesium sulfate daily. The animals recovering also gained in body weight or milk production, or both. The results with two animals indicated that calcium carbonate was ineffective when used as a mineral supplement to the basal ration, but that when these two animals were supplied with monobasic sodium phosphate they improved steadily. The addition of 85 gm. of magnesium sulfate to the ration of one normal animal which was also receiving monobasic sodium phosphate did not induce depraved appetite, even after 360 days' feeding, indicating that large amounts of magnesium sulfate in the drinking water in affected regions is incidental rather than a direct cause of depraved appetite and associated conditions. The chief cause appears to be a lack of phosphorus in the roughage.

From the records of production and analyses of milk, it was found that production appeared to be increased by the use of phosphate supplements, but there was no evidence that the ash of the milk was in any way changed. The conditions of mineral deficiency were reflected in a lowered rate of reproduction and relatively infrequent ovulation. Reproduction was considerably improved by the phosphate supplement.

[Feeding experiments with sheep at the Illinois Station] (*Illinois Sta. Rpt. 1926, pp. 68–76, fig. 1*).—The results of feeding and nutrition experiments with sheep, mostly in continuation of those previously noted, are briefly reported (E. S. R., 56, p. 263).

Tests concluded on energy values of sheep feeds.—The results of tests conducted by W. G. Kammlade and H. H. Mitchell of the relative net energy values of timothy, clover, and alfalfa hay and oat straw have indicated that these feeds are distinctly different when expressed in terms of total digestible nutrients and when expressed in terms of net energy. The roughages were supplemented with 0.15 lb. of linseed oil meal daily per 100 lbs. of live weight, and the timothy hay lot further had free access to mineral supplements. Hay was allowed in sufficient amounts to maintain live weight. The average metabolizable energy per kilogram of dry matter was 2.292 therms for alfalfa hay, 1.944 therms for clover hay, and 2.177 therms for the timothy hay ration. An average of 1.917 lbs. of alfalfa, 1.824 lbs. of clover, or 1.593 lbs. of timothy were required daily per 100 lbs. of live weight for maintenance.

The average results showed that per 100 lbs. of live weight the maintenance requirement of metabolizable energy was 1,864 calories for the alfalfa hay ration, 1,521 calories for the clover hay ration, and 1,507 calories for the timothy hay ration. From this it is concluded that timothy hay has a distinctly higher net energy value than either alfalfa hay or clover hay, and that clover hay has a slightly higher net energy value than alfalfa. The net availability of the metabolizable energy of alfalfa was distinctly lower than that of clover or timothy.

Field and dry lot compared for lamb feeding.—In studying the practice of feeding lambs wholly or partially in the fields, Kammlade and J. H. Knox selected 6 lots of 25 lambs each. Two lots were fed in dry lot throughout the 95 days of the experiment on rations of shelled corn and alfalfa hay and shelled corn and soy bean hay, respectively. The results showed that those receiving alfalfa hay made an average daily gain of 0.32 lb. as compared with 0.36 lb. for those receiving soy bean hay, the latter requiring less corn per 100 lbs. of gain than the former.

Two of the other four lots were fed for 28 days in a corn and soy bean field, while the other two were fed for a similar time in a cornfield. One lot from each field was then finished in dry lot on a ration of shelled corn and

soy bean hay, and shelled corn and alfalfa hay, respectively, while the other lot was left in the field to finish the standing corn when the ration was supplemented with soy bean hay in case of those which had run on corn and soy beans, and with alfalfa for those which had run on the cornfield. Judging from the poor gains secured during the first 28 days and the unusually good gains made during the rest of the feeding period, lambing down corn alone did not prove satisfactory unless supplemented with a legume roughage. Those lambing down corn and soy beans made greater gains than those receiving corn alone. Supplementing corn alone with alfalfa hay gave greater gains than feeding corn and soy beans and then supplementing with soy bean hay.

Soy bean study yields only results of their kind.—The results of digestion experiments with sheep, using rations of alfalfa hay alone, soy bean oil meal alone, and combinations of the two feeds, are reported by T. S. Hamilton and Kammlade.

Comparing the results obtained with those in which the soy bean concentrates were fed with oat straw and soy bean straw, it was evident that a marked associated digestibility existed between the concentrates and roughages when fed in the same ration. The digestibility of the ether extract was found to vary directly with the fat content of the ration. The coefficients obtained in the single trial with soy bean oil meal alone were higher for dry matter and crude protein than any of the average estimated coefficients from other experiments, while the coefficient for nitrogen-free extract agreed fairly well. The digestibility of the crude fiber was 55 per cent, while the estimated coefficients were either negative or above 100 per cent in all cases. Of the gross energy of the meal 73 per cent was metabolizable.

Lamb feeding experiments, 1925–1926, R. F. Johnson (*Idaho Sta. Circ. 40 (1926), pp. 4*).—The results of a 100-day test of the relative value of alfalfa seed screenings and beet pulp as supplements to a ration of alfalfa hay and 1 lb. of barley per head daily for fattening western lambs of Rambouillet breeding, averaging 62 lbs. in live weight, are reported.

The 124 lambs on the basal ration of alfalfa and barley made an average daily gain of 0.24 lb. per head and required 937 lbs. of hay and 357 lbs. of barley per 100 lbs. of gain. When the ration was supplemented with alfalfa screenings the lambs made an average daily gain of 0.25 lb. per head, but considerable difficulty was experienced in getting the lambs to consume the screenings due to the presence of unpalatable weed seeds.

Supplementing the alfalfa and barley ration with 1.05 and 2.09 lbs. of beet pulp per head daily produced an average daily gain of 0.27 lb. by each method of feeding, but the inclusion of the larger amount of beet pulp reduced the calculated feed costs per 100 lbs. of gain, which were lower in these 2 lots than in the other 2 lots fed in this experiment. The consumption of hay and barley were both reduced by the inclusion of the beet pulp in the ration.

Lamb feeding investigations, 1925–26, H. E. Reed and H. W. Marston (*Kansas Sta. Circ. 131 (1926), pp. 3, fig. 1*).—Since alfalfa hay appears to be the best Kansas roughage for fattening lambs, a test was conducted with 3 lots of 52 67-lb. lambs each to determine the amount of alfalfa hay that could be most efficiently included in the ration. For this purpose the rations of hay were limited in the different lots to 0.5, 1.0, and 1.5 lbs., respectively, per head daily. Shelled corn was full-fed in all lots.

The results showed that during the first 20 days the gains increased with the amount of hay fed, but during the last two 20-day periods of the 60-day experiment the gains increased with the amount of corn fed. The average gains per head in the 3 lots for the entire test differed by less than 1 lb. but

were in favor of the lot consuming the smallest amount of alfalfa hay. The best finish and the lowest feed cost per unit of gain were also associated with the smallest consumption of alfalfa.

It is concluded that the feeding of 1.5 lbs. of alfalfa per head daily throughout the fattening period prevented the consumption of proper amounts of corn, though larger amounts of hay could be fed more advantageously during the first than during the last part of the fattening period.

[Feeding experiments with swine at the Arkansas Station] (*Arkansas Sta. Bul. 215 (1926), pp. 32–35*).—The results of three experiments are noted.

Soft pork investigations with rice by-products.—After 8 weeks' feeding on rice bran and tankage and on rice polish and tankage, pigs averaging 67.5 lbs. in weight were divided into two lots, one of which received brewers' rice and tankage while the other pair received corn and tankage for hardening in a final 8 weeks' period. Access to minerals was allowed throughout the experiment. The pigs made average daily gains of 0.42 and 0.52 lb. while on the rice bran and rice polish rations, respectively, due to the fact that the bran contained an abnormal amount of rice hulls and the polish produced scouring. Replacing these feeds with brewers' rice or corn resulted in very satisfactory gains. Carcass analyses of the animals at the end of the experiment indicated that corn was slightly more effective than brewers' rice for hardening soft pork. More economical results were obtained with corn, largely due to its lower cost.

Legume hay v. tankage for wintering brood sows.—Gilts receiving soy-bean hay with corn farrowed extra good litters, while only one gilt in the lot receiving corn and tankage farrowed a satisfactory litter. These results indicated that the soy bean hay was not responsible for previous troubles with abortion which have been experienced with animals receiving this roughage.

In checking the results with albino rats it was found that rations made up of corn and soy bean hay with and without tankage allowed the production of normal litters of young, but difficulties in rearing were evident when these rations were used during the lactation period.

Forage crops for fattening swine.—Pasture trials with Sudan grass and sweet clover have indicated that there is very little difference in the values of these two crops, though the pasturing season was very short. A protein supplement to corn was necessary even when the hogs are on fairly good pasture, and a mineral mixture will not replace the protein supplements under such conditions.

[Feeding experiments with swine at the Delaware Station], A. E. Tomhave (*Delaware Sta. Bul. 147 (1926), pp. 10, 11, 12*).—The results of the following experiments are briefly reported:

Alfalfa hay in the winter ration for brood sows.—In continuing this experiment (E. S. R., 54, p. 665), two groups of sows were again fed alfalfa leaves or tankage as protein supplements to a ration of white ear corn and minerals. The results indicated that the alfalfa leaves supplied some essential that was evidently lacking in the white ear corn, tankage, and mineral ration, as the sows receiving alfalfa produced pigs averaging 2.55 lbs. when farrowed as compared with 2.38 lbs. on the tankage ration; 40.6 per cent of the former and only 10.7 per cent of the latter were classified as strong, and at the end of the first 7 days only 3 per cent of the pigs farrowed were dead due to weakness in the alfalfa lot, as compared with 32.3 per cent of the pigs in the tankage lot. The average daily consumption of the alfalfa leaves was 2.27 lbs. per head, and their use materially reduced the cost of wintering.

Protein supplements for growing fattening pigs.—In a test of the relative

one lot receiving a ration of yellow hominy, middlings, and tankage, while in the other lots the tankage was replaced by ground soy beans or a mixture of ground soy beans and bone meal 85:15. During the 92-day experiment the following average daily gains were made with the different protein supplements: Tankage 1.02 lbs., ground soy beans 0.65 lb., and ground soy beans and bone meal 0.75 lb. There were required 35.2 and 21.4 per cent more concentrates to produce 100 lbs. of gain on the ground soy bean and ground soy bean and mineral rations than on the tankage ration. Ground soy beans were evidently not as efficient as tankage for pork production, but their efficiency was considerably improved by the addition of bone meal.

Forage crops for swine in Delaware.—In one trial alfalfa forage was found to be distinctly superior to rape, due to the fact that 320 lbs. of feed were required per 100 lbs. of gain on alfalfa, as compared with 349 lbs. on rape. The pork produced per acre of forage was calculated at 3,547 and 2,082 lbs. on the respective crops.

In another experiment pigs fed to an average weight of 150 lbs. required 350 lbs. of feed per 100 lbs. of gain when full-fed on pasture, but only 325 lbs. of feed per 100 lbs. of gain when receiving a limited ration of 3 per cent of their live weight until they reached 100 lbs., after which they were full-fed. Limited feeding of late farrowed pigs allowed for utilization of an abundance of forage as well as considerable new corn, while full-feeding usually allows for marketing earlier in the fall.

In a comparison of cowpeas and soy beans as forage crops, average daily gains of 1.1 lbs. and 1.43 lbs. were produced on the respective types of forage. Only 340 lbs. of feed were required per 100 lbs. of gain on soy beans as compared with 428 lbs. on cowpeas.

[Experiments with swine at the Illinois Station] (*Illinois Sta. Rpt. 1926, pp. 49–59, figs. 3*).—The results of experiments, mostly continuations of those previously noted (E. S. R., 56, p. 264), are briefly reported.

Sow's gaining power not inherited by litter.—Twenty Poland China gilts were hand-fed individually a full ration by W. E. Carroll, R. A. Smith, and E. Roberts in order to determine the rate and economy of gains of each. The pigs produced by six of these sows after mating them to the same boar were similarly fed, but the rate and economy of gain made by the litters showed no close agreement when compared with the feed records of their dams.

Crossbred pigs made no greater gains this year.—Roberts and Carroll found that crossbred and purebred offspring produced by double matings of a Duroc-Jersey and Poland China boar with 5 Duroc-Jersey and 5 Poland China gilts showed no significant difference in the vigor or size of the crossbred and purebred pigs at birth, and no marked superiority of the crossbred pigs over the purebreds was apparent in their capacity to make rapid and economical gains when fed out to a weight of approximately 200 lbs.

Oats give good results in brood sow ration.—In experiments to determine the advisability of including oats in rations of ear corn and minerals with or without tankage or alfalfa hay for brood sows and gilts, Carroll and Smith found that such rations met the requirements of the sows and produced strong vigorous pigs, from which it is concluded that oats may be used rather extensively in the brood sow ration with satisfactory results.

Oil in soy beans found to be cause of soft pork.—In studying the relative feeding value of soy beans and soy bean products for pork production, Carroll, Smith, S. Bull, and J. H. Longwell self-fed 4 lots of 20 pigs each, averaging 63 to 64 lbs. in live weight, to a final weight of 230 lbs. The rations of 3 of the lots consisted of ground corn, alfalfa meal, and minerals with supplements of

tankage, ground soy beans, and soy bean oil meal, respectively. The fourth lot received shelled corn, whole soy beans, minerals, and blue grass pasture. The results showed that the poorest gains were made by the lot receiving ground soy beans, 0.96 lb. per day, while with soy bean oil meal the gains were 1.13 lbs. per day as compared with 1.55 lbs. by the lot receiving tankage and 1.44 lbs. by the lot receiving whole soy beans with blue grass pasture. The soy beans did not appear to be palatable.

At the conclusion of the experiment the pigs were slaughtered and studied for the hardness of fat in the carcasses. The soy bean oil produced carcasses lacking in firmness, while tankage or soy bean oil meal produced firm carcasses. The fresh cuts from the soy bean oil carcasses were soft, flabby, difficult to cut, and oily in appearance, and the lard was soft.

In a second experiment three lots of 15 pigs each, averaging 66 lbs. in live weight, and one lot of 19 pigs, averaging 74 lbs. in live weight, were fed to a final weight of 232 to 235 lbs. to determine the amount of soy bean oil which could be included in the ration without producing soft pork. All lots received a basal ration of corn and alfalfa meal supplemented in one lot with tankage, in another with soy bean oil meal, and in the other two with soy bean oil meal and different amounts of soy bean oil. The results showed that the hogs in these respective lots made average daily gains of 1.59, 1.39, 1.30, and 1.40 lbs. The average dressing percentages were 82.1, 78, 78.4, and 78.6 per cent, or distinctly a higher dressing percentage for the tankage-fed pigs. All of the carcasses in the lot receiving tankage were hard, while only three were hard in the lot receiving soy bean oil meal, and those receiving the soy bean oil were largely soft, 14 out of the 15 pigs being soft in the lot receiving soy bean oil equivalent to the amount in 19 per cent of soy beans.

Hogging down corn, W. L. Robison (*Ohio Sta. Bul. 398 (1926), pp. 301–339, figs. 9*).—The combined results of several years' experiments in hogging down corn, relating particularly to comparisons of mineral and protein supplements, are presented and analyzed in connection with tests at other stations.

With standing corn, soy beans, tankage, and minerals more rapid and greater gains per bushel of corn consumed were produced than with standing corn, tankage, and minerals, but the returns per acre were greater with the latter ration, as the soy beans reduced the yield of corn. Rape proved slightly superior to soy beans in the combination of corn and tankage or corn and minerals in favorable seasons, but in dry seasons made little growth when seeded at the time of the last cultivation. Access to clover pasture with standing corn and tankage improved the rate and economy of gain.

The results of 9 experiments at Wooster and 6 at the Miami County Experiment Farm consistently indicated a larger return per bushel of corn when the corn was harvested and fed rather than hogged down. Hogging down immature corn reduced the gains produced per acre, but allowed the hogs to be marketed at a time when prices were more satisfactory than when the corn had matured.

Fillies wintered well on oats, soy bean roughage (*Illinois Sta. Rpt. 1926, pp. 66, 68*).—In continuing the studies of relative values of rations for draft fillies (E. S. R., 56, p. 270), J. L. Edmonds and C. W. Crawford found that equal parts of sheaf oats and soy bean hay supplemented with a light feeding of crushed oats and bran were satisfactory for both growth and economical wintering of weanling and yearling Percheron fillies. A pasture combination of blue grass in the spring and fall and sweet clover during the hot, dry months was satisfactory.

[Feeding experiments with poultry at the Delaware Station], A. E. Tomhave and C. W. Mumford (*Delaware Sta. Bul. 147 (1926), pp. 13, 14*).—The results of three experiments are briefly reported.

Soy beans for baby chicks.—Three pens of 350 chicks each were used for comparing protein supplements of meat scrap and dried buttermilk, ground soy beans and dried buttermilk, and ground soy beans. At 7 weeks of age the average weights of the males and females receiving the two types of animal protein were 1.020 and 0.957 lbs., while those receiving ground soy beans and dried buttermilk averaged 0.860 and 0.740 lbs., and those receiving ground soy beans as the only protein supplement averaged 0.433 and 0.557 lbs.

Ground soy beans in the ration for laying pullets.—Preliminary results of a comparative test of meat scrap and ground soy beans as protein supplements in a mash of laying hens showed that those receiving meat scrap laid larger numbers of eggs and consumed considerably more feed.

Artificial illumination for pullets.—Under good management unlighted pens were made to produce nearly as many eggs as lighted pens in two years' experiments.

[Experiments with poultry at the Illinois Station] (*Illinois Sta. Rpt. 1926, pp. 78–81*).—In studies of the necessary amount of turning of eggs during incubation, by L. E. Card, eggs not turned at all hatched poorly, while those turned only during the first 6 days hatched almost as well as eggs turned twice daily throughout the incubation period.

Continuing the study of the energy values of feed for chickens (E. S. R., 56, p. 270), H. H. Mitchell conducted a series of 25 determinations on the heating effect of corn with Rhode Island Red hens. The average results showed that 100 gm. of corn containing approximately 89 per cent of dry matter had a heating effect of 52 calories, though considerable variation was shown in the individual determinations.

From these data it is concluded that 1 lb. of corn has a total gross energy content of 1,761 calories, 15 per cent of which is lost to the chicken in intestinal and urinary excretions. As 236 calories represents the heating effect of the corn, the net energy value per pound becomes 1,261 calories. Thus only 72 per cent is available to the chicken for maintaining its life activities, for muscular activity, or for the production of new body tissue in growth and fattening. As compared with other animals the chicken converts the energy of corn to its own use much more efficiently than the steer and probably more efficiently than the pig.

In studies by Card, M. H. Keith, and Mitchell of the rate of digestion of a whole corn ration, a ground corn ration, and a ration composed of ground corn and tankage 4:1, 25 birds were killed at intervals varying from 11 to 35 hours after consuming 50 gm. of each of these rations. Though considerable variability was observed in the proportionate amounts of feed found in the different segments of the alimentary canal, the results indicated that the dry matter content of the different segments was not affected by the kind of ration furnished. The type of ration tended to influence the time required for the crop to entry. Of the whole corn ration the crop emptied in about 11 hours, but an appreciably longer time was required for the ground feeds to pass on through the crop, and as the crop emptied the gizzard also quickly emptied.

The moisture content of the material in the different segments of the alimentary canal showed some variability. The percentage of moisture in the contents of the gizzard averaged 44.2, in the small intestine 83.0, in the ceca 76.8, and in the contents of the large intestine 78.9. The contents of the small intestine were most constant with respect to the percentage of moisture.

The effect of various sources of animal protein on the egg production and condition of Single Comb White Leghorn pullets, P. T. KISTLER, T. B. CHARLES, and H. C. KNANDEL (*Pennsylvania Sta. Bul. 206 (1926), pp. 23, figs. 3*).—The results of two experiments comparing protein supplements for egg production, which have been previously referred to (E. S. R., 54, p. 368), are reported.

In the first experiment 7 lots of 50 birds each were used for comparing meat scrap and condensed or dried buttermilk when fed separately or in combinations as protein supplements to a basal mash. The protein was supplied in equal amounts in the mash but from the various sources.

In the second experiment 6 lots of 50 birds each were used for comparing similar sources of protein, but in combinations of meat scrap and dried or condensed buttermilk. Coconut oil meal was also used with one lot. The results of the second experiment were somewhat complicated by parasites, early winter molt, and an epidemic of chicken pox and roup.

In general, however, the two experiments indicated that dried and condensed buttermilks were efficient and economical sources of protein for egg production when used in proper combinations with meat scrap, due to the increased egg production which is obtained and which more than compensates for the increased feed cost. The advantages suggested for the milk products are that they maintain the body weight of the fowls in the most efficient manner, increase the size of the eggs, reduce the tendency toward early molting by increasing production, and maintain a more even production throughout the year.

A study of the relative value of certain root crops and salmon oil as sources of vitamin A for poultry, D. E. DAVIS and J. R. BEACH (*California Sta. Bul. 412 (1926), pp. 3–15*).—In continuing the studies of the relative value of succulent feeds as sources of vitamin A for poultry (E. S. R., 52, p. 875), lots of 10 pullets each were fed a vitamin A deficient ration supplemented with one variety in each lot of yellow, red, or white carrots, red, yellow, or white mangels, or yellow or white turnips. Salmon oil was the only source of vitamin A for one lot, and another lot received the basal ration only. At the start of the experiment the roots were allowed at the rate of 1 gm. per bird daily and the salmon oil at the rate of 1 cc., but the amount was doubled when the birds of a lot showed signs of ophthalmia, or pustules in the mouth, or esophagus, and redoubled with the further appearance of lesions indicating a vitamin A deficiency in the ration. The experiment lasted 96 days.

The results showed that none of the birds receiving the yellow or red carrots or the salmon oil in minimum doses developed the nutritional diseases. Their live weight increases varied from 41 to 44.5 per cent, and they laid at 30, 33, and 26 per cent rates, respectively, during the last 41 days of the test. Salmon oil in 1 cc. doses also cured birds showing lesions of vitamin A deficiency, and compared favorably with cod-liver oil as a source of vitamin A. It is, therefore, concluded that yellow and red carrots are as good sources of vitamin A as the common varieties of green feeds used for poultry.

With a few individual exceptions, practically all the birds in the other lots developed symptoms of vitamin A deficiency even though the amounts of the roots were increased to 8 to 32 gm. per bird daily. The first symptoms of the deficiency occurred on the thirty-second day in the control lot and on the thirty-third day with yellow turnips. One bird in the white turnip lot showed characteristic lesions on the fifty-fourth day.

Feeding chickens, R. M. SHERWOOD (*Texas Sta. Circ. 42 (1926), pp. 3–7*).—This consists mainly of suggested rations for chicks, fattening cockerels, pullets, and laying hens.

Fitting and exhibiting standard-bred poultry, H. H. Steup (*Kansas Sta. Circ. 127 (1926), pp. 39, figs. 18*).—General directions for fitting, exhibiting, and judging poultry, including illustrations and descriptions of ideal and defective characters and other data, are given.

DAIRY FARMING—DAIRYING

The composition, digestibility, and feeding value of hydrolyzed sawdust, J. G. Archibald (*Jour. Dairy Sci., 9 (1926), No. 3, pp. 257–271*).—In an investigation conducted at the Massachusetts Experiment Station with the cooperation of the U. S. D. A. Forest Products Laboratory, the nutritive properties of sawdust cooked with dilute sulfuric acid under 120 lbs. pressure were studied. Analyses of hydrolyzed Douglas fir and eastern white pine sawdust showed that approximately 95 per cent of the dry matter was composed of nitrogen-free extract and crude fiber. About 21 per cent of the original sawdust was converted into sugar by the treatment.

In a test of the palatability of this feed the rations of 11 cows were supplemented with amounts of Douglas fir sawdust not exceeding 5 lbs. daily. All refused the hydrolyzed sawdust when it was fed alone, but 8 showed no dislike for it when it was mixed with the grain.

Six digestion trials, each of 16 days' duration, were carried on with 3 sheep each. The daily rations fed in all experiments consisted of 400 gm. of hay, 125 gm. of gluten feed, 100 gm. of hydrolyzed sawdust, and 10 gm. of salt. The results of the digestion trials with the two kinds of sawdust showed that the digestible nutrients were principally confined to nitrogen-free extract, as the other constituents were practically unattacked. Omitting the results of the 2 experiments showing the greatest deviation with each kind of sawdust, 32.73 per cent of the dry matter and 60.21 per cent of the nitrogen-free extract of the Douglas fir sawdust and 46.22 per cent of the dry matter and 66.42 per cent of the nitrogen-free extract of the eastern white pine sawdust were digestible. The fiber of the latter appeared to be somewhat more digestible than that of the former. Calculations of the net energy values of these feeds indicated that the eastern white pine sawdust had an apparent value of 18.6 therms of net energy per 100 lbs., while the net energy value of the Douglas fir sawdust was a minus quantity. The digestibility of the sawdust residue was so low and so variable that this part of the product evidently had no food value.

Trials of the feeding value of both kinds of treated sawdust were conducted with 6 cows, comparing this feed with cornstarch by the double reversal method in 11-week periods. The amounts of cornstarch and sawdust fed were equalized on the basis of the digestible nutrients of each. The basal ration consisted of mixed hay and a grain mixture of which 20 per cent was composed of cornstarch or an equivalent amount of sawdust. The combined results with 4 cows which completed the test normally show that those receiving the Douglas fir sawdust produced 98.5 lbs. less milk in 28 days than those receiving the cornstarch ration. The 5 cows on the white pine sawdust ration produced 42 lbs. less milk than on the starch ration.

The net decreases in milk production during the first 10 days after the ration was changed were 41.3 lbs. on starch and 127.8 lbs. on the Douglas fir sawdust, and in the second experiment 9.0 lbs. on starch and 42.8 lbs. on the eastern white pine sawdust. All groups showed a net gain in weight, but the amounts were larger on the starch rations than on the sawdust rations

Though the animals evidently derived some benefit from the sawdust, it is not believed that hydrolyzed sawdust as now prepared has any economic value, considering the present cost of carbohydrate feeds.

[**Feeding experiments with dairy cattle at the Arkansas Station**] (*Arkansas Sta. Bul. 215 (1926), pp. 30–32*).—Two lots of three cows each were selected for comparing by the reversal method rice bran and wheat bran added to the rations of corn silage, alfalfa hay, and a grain mixture of yellow corn, cottonseed meal, linseed oil meal, and gluten feed. The feeding periods were 8 weeks in duration with transition periods of 1 week. The cows produced 7 per cent more milk and 5 per cent more butterfat on the rice bran ration with practically the same consumption of feed, and also made slightly greater gains in body weight than when wheat bran was included in the ration.

Three lots of heifers, consisting of a total of 3 Holsteins and 6 Jerseys, were used for comparing alfalfa and soy bean hay when fed with a grain mixture. One lot receiving soy bean hay also received 2 per cent of finely ground steamed bone meal added to the grain mixture and 10 cc. of cod-liver oil twice weekly. The heifers receiving soy bean hay and grain without the additional supplements made the largest daily gain and required the least feed per unit of gain, though the advantage over alfalfa hay was very slight. The same animals also showed the largest increase in most body measurements. The lot receiving the mineral supplement and cod-liver oil occupied the third place with respect to percentage of increase, except in case of shank circumference, in which the alfalfa-hay lot excelled and the lot receiving soy bean hay with supplements was third. *It is concluded that leafy bright colored soy bean hay cut before* the stems become mature is equal to alfalfa hay for growing heifers. Additions of bone meal and cod-liver oil to soy bean hay and grain were of no particular benefit.

[**Experiments with dairy cattle at the Illinois Station**] (*Illinois Sta. Rpt. 1926, pp. 89, 90, 91, 92, 93, 94*).—In studies of the relation between variations in temperature and humidity from day to day and the amount and quality of milk produced by individual cows, F. A. Davidson found that in general a falling temperature from day to day increased the percentage of total solids in the milk, while a rising temperature decreased this percentage without noticeably affecting the yield of the milk.

Comparative feeding tests of ground, chaffed, and whole soy-bean hay for dairy cattle, conducted by W. B. Nevens, indicated that chaffed hay produced a gain of approximately 54 lbs. and grinding a gain of about 50 lbs. of digestible dry matter per ton of hay fed, but the economy of the extra preparation was questioned.

The results of a continued study of the effect of self-feeding on dairy cattle by Nevens (E. S. R., 56, p. 271) indicated that the high protein rations consumed had a depressing effect on milk production, and that milk production was not stimulated beyond what would be expected with good feeding methods. Self-feeding has proved uneconomical as the cows remain in high condition and use feed uneconomically.

Studies of the comparative persistency of lactation in Guernsey and Holstein cattle by W. L. Gaines indicated that both breeds showed normal distribution curves for the persistency values, which were in both cases quite closely related to the initial rate of production. Persistency was not affected by age, except as age affected the initial rate of production. Persistency, however, was greatly affected by environmental factors, and to a slight extent by genetic factors. This character did not appear to be a promising one for genetic improvement.

Short-time tests at approximately 6 months after calving appeared to be the best stage of lactation for affording an index of the year's yield.

A commercial preparation containing edestin obtained from cottonseed and claimed to stimulate milk secretion in nursing mothers, when fed at the rate of 5 oz. per day per 1,000 lbs. of live weight to 4 cows in various stages of lactation, had no appreciable effect on the rate of milk secretion.

[Experiments in dairying at the Illinois Station] (*Illinois Sta. Rpt. 1926, pp. 93, 95, 96, 97*).—M. H. Campbell found that the size of fat globules in milk could be measured by diluting the milk to 100 times its volume with a solution of water and glycerin and placing this solution in a Newbauer hemacytometer. The fat globule was then directly measured under the microscope by means of the euscope.

Studies by M. J. Prucha indicated that the use of sodium hypochlorite, calcium hypochlorite, or chloramine–T will practically sterilize dairy utensils. A solution containing at least 150 parts of chlorine per million of water is recommended for cans and similar utensils.

Prucha and J. M. Brannon found that butter passed through certain printing machines in which it was crushed did not keep as well as butter not so treated, and that undesirable flavors developed in such print butter.

Studies of the factors relating to shrinkage in ice cream by H. A. Ruehe and P. H. Tracy indicated that some commercial improvers cause an enzymic change in the milk protein which leads to shrinkage. The factors tending to hasten the shrinkage of ice cream are alternating high and low temperatures, long storage periods, high overrun, increased acidity in the mix, and high percentages of milk solids-not-fat.

Studies in the manufacture of cottage cheese by Ruehe, Tracy, and A. S. Ambrose indicated that a satisfactory product can be manufactured from pasteurized skim milk, using pure lactic acid cultures for ripening, with or without the addition of rennet or pepsin. Washing the curd and salting removed much of the lactic acid present and consequently much of the flavor, tending to cause a flat flavor or lack of flavor in the resulting product. Such cheese tended to spoil more rapidly than cheese having a higher acid content.

Control of market milk sold by a Michigan dairy, 1022–1925, L. H. Cooledge (*Michigan Sta. Quart. Bul., 9 (1926), No. 2, pp. 56–60*).—An account is given of the use of methods for improving the bacterial counts and grade as determined by the pH score of raw milk delivered to a Michigan dairy from 1922 to 1924. The reduction in the bacterial count through pasteurization was materially increased at this plant by thoroughly sterilizing the cooler before use by running steam through the pipes.

Evidence indicates that the bacterial count of chocolate milk may be controlled by better sanitary measures.

[Experiments at the Arkansas Station with neutralizers and starters] (*Arkansas Sta. Bul. 215 (1926), pp. 35, 36*).—Analyses of several commercial neutralizing agents indicate that the bases of these substances are either one or more of the following ingredients: Calcium oxide, magnesium oxide, calcium hydrate, calcium carbonate, sodium carbonate, and sodium bicarbonate. Data on the solubility of the agents show that those neutralizers with a high percentage of calcium or magnesium in the form of a hydrate or oxide are more insoluble than those composed of calcium and sodium in the form of a carbonate or bicarbonate. Lime neutralizers have a tendency to cause a limey flavor, while soda neutralizers tend to produce soapy flavors. Lime neutralizers were much more efficient than soda neutralizers.

In studies of 9 different starter cultures with reference to their effect on the quality of the butter and the type of organisms which predominate in each, it was found that the addition of 5 to 20 per cent of a reliable starter culture to sour neutralized cream enhanced the flavor of the butter sufficiently to compensate for the extra labor and expense involved. All brands of starter cultures used gave equally good results, and there were only slight differences in the flavor of the butter produced. All the commercial starters studied contained practically the same types of lactic acid bacteria, but at certain times undesirable organisms such as yeasts, molds, and alkaline-producing bacteria were present as a result of contamination during manufacture.

A suggested bacteriological standard for ice cream, F. W. FABIAN (*Michigan Sta. Spec. Bul. 158 (1926), pp. 3–18*).—Based on bacteriological analyses of 1,110 samples of ice cream from 36 different ice cream plants located in 5 different cities of Michigan, in which samples the numbers of bacteria ranged from 1,000 to 300,000,000 per gram, the author suggests that the plate counts made by standard methods of ice cream should not be over 100,000 per gram. Evidence is presented to show that it is possible and practical for sanitary ice cream manufacturing plants to make ice cream conforming to such a standard. A legal requirement for pasteurization of the mix at 150° F. for 30 minutes in order to control pathogenic organisms is also recommended.

VETERINARY MEDICINE

[Animal disease investigations at the Delaware Station], C. C. PALMER and H. R. BAKER (*Delaware Sta. Bul. 147 (1926), pp. 8, 9*).—The work in animal pathology during the year is here briefly referred to.

The university herd, which contained 20 per cent reactors to the abortion test four years ago, is now composed entirely of nonreacting animals. This has been accomplished through rigid isolation at calving time to prevent the spread of the disease and the disposal of reacting animals as rapidly as possible. The breeders have shown considerable interest in the progress of the work and are now fostering a plan for the establishment of State-accredited abortion-free herds, the work to be carried on under State supervision.

In investigations of the vaccine treatment of roup, four cultures of secondary invaders in outbreaks of ocular roup were isolated and found to be strains of *Staphylococcus albus*, and in one case *Bacterium coli* was also present. In an experimental transmission a roupy bird was placed with a normal bird in each of five cages, and it was observed that the heads of the birds would frequently be rubbed together while feeding, but their constant contact for eight weeks failed to result in transmission of the disease to any of the normal birds. The treatment of nine cases of ocular roup with boric acid resulted in their recovery, indicating that individual treatment in this manner may be highly efficient.

In a study of the bacteriophage in the control of fowl typhoid, negative results were obtained. *B. sanguinarium* soon lost its virulence when grown on artificial media.

Anti-abortion vaccines (*Arkansas Sta. Bul. 215 (1926), pp. 37, 38*).—In the course of a brief discussion of the subject, reference is made to work undertaken with a view to determining whether aggressins were produced by cultures of *Bacillus abortus* introduced into the peritoneal cavity of guinea pigs and to studying their antigenic efficacy.

It was found that the injection of 10 cc. of a suspension of virulent *B. abortus*, in density comparable to tube No. 3 of the McFarland nephelometer, into the peritoneal cavity of guinea pigs resulted in the death of the animals

in from 16 to 26 hours. Twelve cc. of purulent exudate were received from the peritoneal cavities of selected animals, which exudate contained numerous typical organisms and might be presupposed to contain aggressins if such are produced by *B. abortus*.

"The exudate was centrifuged and phenolized, and sealed in glass ampules. Guinea pigs injected with exudate and with a suspension of live cultures simultaneously presented at 2 and 4 weeks no more marked progression of the inoculation disease than guinea pigs receiving live cultures only. Guinea pigs inoculated with 2.0 cc. exudate showed no more advanced pathological changes than guinea pigs receiving 0.5 cc. exudate. Thus no aggressin action was observed, and it may be presumed that *B. abortus* does not produce aggressins, at least under the conditions outlined."

Anthrax prophylaxis (*Arkansas Sta. Bul. 215 (1926), pp. 64, 65*).—In five separate attempts to attenuate anthrax bacilli by cultivation on agar with high sodium chloride content, three were successful, but in the other two no reduction of virulence was noted. This indicates that the method of attenuation employed should not be expected to yield the desired results in all cases. It was found possible to secure cultures of graded virulence by continuing the attenuation process for four or five weeks, thus indicating that the loss of virulence of the anthrax bacillus is a more or less gradual process with the means here used and is analogous to what occurs during attenuation by cultivation above optimum temperatures. In field tests it was found that injections of up to 200,000,000 NaCl attenuated anthrax spores can be made into mules without inducing febrile disturbance when the animals are idle.

Foot-and-mouth disease, J. R. Mohler (*U. S. Dept. Agr., Dept. Circ. 400 (1926), pp. 83, figs. 12*).—The first part of this account deals in detail with the California outbreak in 1924, and this is followed by an account of the Texas outbreaks in 1924 and 1925.

Inclusion bodies in foot-and-mouth disease [trans. title], K. Trautwein (*Arch. Wiss. u. Prakt. Tierheilk., 52 (1925), No. 6, pp. 475–482, pl. 1, figs. 2; abs. in Trop. Vet. Bul., 14* (1926), *No. 1, p. 29*).—The author confirms the observations of Gins,[1] and Gins and Kraus[2] regarding the occurence of inclusion bodies in specimens from foot-and-mouth disease lesions. He states that, whereas Gins showed that these could be detected from 2 to 4 days after infection in guinea pigs, he has been able to find them in still larger numbers up to 18 days after infection. The author considers them to be fragments of chromatin derived from leucocytes.

Immunization against foot-and-mouth disease [trans. title], H. Vallée, H. Carré, and P. Rinjard (*Rev. Gén. Méd. Vét., 35 (1926), No. 411, pp. 129–134; trans in Vet. Rec., 6 (1926), No. 16, pp. 361, 362*).—This is a report on the results of attempts at vaccination carried out with the authors' viruses O and A, separately and with the two virulent forms used together. The authors call attention to the fact that all essential researches on foot-and-mouth disease should be carried out on bovines.

Foot-and-mouth disease: Control by chemotherapy, G. K. Walker and W. Taylor (*Punjab Dept. Agr., Vet. Bul. 17 (1926), pp. 22; abs. in Vet. Rec., 6 (1926), No. 29, pp. 611, 612, 613*).—This is a report of experiments in which, after a period of incubation and during the thermal stage of foot-and-mouth disease, each animal received Lugol's solution of iodine intravenously, in doses of from 50 to 100 cc. The solution consisted of iodine 1 gm., potassium iodide

[1] H. A. Gins. Centbl. Bakt. [etc.], 1. Abt., Orig., 88 (1922), No. 4, pp. 265–269.
[2] H. A. Gins and C. Krause. Ergeb. Allg. Path. Mensch. u. Tiere, 20 (1924) ... [illegible]

2 gm., and distilled water 300 cc. The results lead to the conclusion that cattle infected with foot-and-mouth disease can be cured in the febrile stage by the intravenous injection of Lugol's solution, and that such animals will not develop eruptive lesions if the treatment is adopted in time. It is pointed out that iodine is very rapidly eliminated from the system and the amount used is unlikely to have any harmful effect on flesh or milk.

Foot-and-mouth disease, S. N. VENDEL (*Vet. Rec., 6 (1926), No. 42, pp. 931–936, figs. 2*).—This is an account of observations and studies conducted by the author in Denmark. The results of such as relate to the treatment of the disease by chemotherapy correspond closely with those of Walker and Taylor, above noted.

Avian tuberculosis can be transmitted to calves (*Illinois Sta. Rpt. 1926, pp. 65, 66*).—Studies by R. Graham and E. A. Tunnicliff indicate that avian tuberculosis is transmitted to calves more slowly and with less regularity than to swine, but that calves are not immune to avian tuberculosis infection. Slight lesions resembling tuberculosis have been found in the mesentery lymph nodes of calves following contact with tuberculous fowls. On only one occasion, however, have the lesions proved virulent when injected into guinea pigs and chickens. The practical significance of avian tuberculosis to calves, as observed in exposure experiments, was confirmed by the results of injecting tuberculous lymph glands of cattle into healthy chickens and guinea pigs. Of 47 lymph glands injected, 6 failed to produce lesions in either chickens or guinea pigs, 29 of the 41 remaining proved to be of the mammalian type, 4 were distinctly of the avian type, and 8 were capable of producing gross lesions in chickens as well as in guinea pigs. The mild character of the gross lesions in the chickens was considered to suggest that they were caused by the intermediate or aberrant types of the mammalian bacilli. It is pointed out that the part played by strains deviating from the normal type may be an important consideration in the ultimate eradication of tuberculosis in animals and in keeping herds free from it.

The results of typing tests on 106 tuberculous sputa from man are considered. The examination of 6 tuberculous lymph glands of children revealed 1 aberrant mammalian strain which produced lesions closely resembling the avian type in fowls.

[Investigations of swine diseases at the Illinois Station] (*Illinois Sta. Rpt. 1926, pp. 59–62*).—A brief reference is made to the continuation of work on the resistance of pigs to hog cholera virus conducted by Roberts and Carroll (E. S. R., 56, p. 275). Further studies by Graham and Tunnicliff (E. S. R., 56, p. 275) indicate that it is practical to immunize pigs from 1 month to 6 weeks old. When pigs are treated at this age, the amount of serum can be reduced to approximately 37.5 per cent of the amount that would be required after weaning.

Progress of investigations on swine abortion conducted by Graham and Tunnicliff is also briefly reported upon. The porcine type of *Bacterium abortum* has been found in several herds in the State. This organism resembles the bovine type but grows more luxuriantly. It is pointed out that the organism may be present in the testicular tissue of young pigs 14 to 16 days after artificial exposure by feeding or intravenous injection. No gross lesions were observed in infected testes.

"*B. abortum* was found in the bulbo-urethral glands and seminal vesicles of an actively breeding boar 17 months after the feeding of the organism, suggesting that males with genito-urinary infection might play a part in the spread of the disease. The nongravid uterus and ovaries of sows may harbor

M. abortum for a period of 6 to 20 months following subcutaneous or intravaginal injection, or infection by feeding or by association with infected animals. . . . Pigs 10 to 12 weeks old injected subcutaneously with *B. abortum* vaccine gave a rather definite primary agglutination curve extending over a period of approximately 6 months, followed by a secondary curve of shorter duration lasting approximately 2 months. Uninoculated control pigs in the same pen showed comparable primary and secondary agglutination curves with comparable maximum reactions. The maximum agglutination titer of the inoculated pigs apparently precedes the agglutination reaction of the control pigs by about 90 days. Healthy pigs allowed to associate with vaccinated pigs, with living culture, may contract the disease. Pigs vaccinated 10 to 12 weeks old with *B. abortum* were not followed by an intra-uterine infection at the first farrowing approximately 9 months later, as was determined by direct cultures and by guinea pig inoculations of feti and fetal membranes. Of 35 control or uninoculated pigs of the same age that were exposed to the vaccinated pigs, 5 aborted, while none of the 24 pigs receiving the vaccine aborted."

Bacillary white diarrhea in fowl, L. D. Bushnell, W. R. Hinshaw, and L. F. Payne (*Kansas Sta. Tech. Bul. 21 (1926), pp. 3–85, figs. 4*).—This is a report of investigations extending over a period of five years, presented in connection with a review of the literature on the subject, a list of 65 references to which is included. Following a brief introduction, the historical review of the literature (pp. 7-29) is given in chronological order. The nature of *Salmonella pullorum*, next considered (pp. 29–32), includes a table which graphically illustrates the fermentation of various carbohydrates within a three weeks' period of incubation at 37° C. Under the heading of incidence of the disease (pp. 33–38), the disease in adult fowls and in chicks is considered. The symptoms and pathology of the disease (pp. 38–40) and the sources and modes of infection (pp. 40–49) are then dealt with. Under the latter heading the incubator as a source of infection is considered, a report of investigations of which by Hinshaw, Upp, and Moore has been noted (E. S. R., 55, p. 374).

In considering the influence of the disease on fertility and hatchability (pp. 50–63), the authors present much data in 12 tables. It is shown that in many cases there is a marked reduction in fertility and hatchability between the eggs of reacting and nonreacting birds. With 19 infected hens 45.2 per cent of the 387 eggs were fertile, and 25.8 per cent hatched against 63.4 per cent fertile and 57.3 per cent hatched of 5,066 eggs from 164 noninfected hens. Individual hatching records of infected and noninfected birds, data showing the influence of age upon fertility and hatchability of reactors and nonreactors, the decrease in agglutinins in serum of a single fowl, and the influence of the male on fertility and hatchability are also shown. The average percentage of fertility is estimated for nonreactors at 90, for reactors 70; hatchability of fertile eggs for nonreactors 70, for reactors 58; livability of chicks from nonreactors 90, from reactors 50; infection in Kansas flocks 25; and of Kansas flocks infected 75. The losses to the hatcheryman and to purchasers of day-old chicks are also considered.

It is pointed out (pp. 66, 67) that sour milk may be of value as an intestinal antiseptic and to prevent chicks from becoming infected through the food, but that it has no influence on the course of the disease once it has become established.

The account concludes with an extended discussion of testing for the disease. With a view to developing some standard of procedure which will be universally used, the authors describe and report upon a comparison made of the Kansas

The results indicate the Kansas (K. S. A. C.) two-tube (1:20, and 1:80) test to be the most effective thus devised. No trouble was experienced with the "fat-like" phenomenon when less than 0.3 per cent phenol is used for a preservative.

The authors conclude from their study that for general testing a two-tube test of a low and high dilution will prove most efficient because it avoids prozone cases and determines the largest number of carriers. If a one-tube test is used it should be one using as low a dilution of serum as possible. They point out that the small unit value of an average bird will not warrant leaving it in a flock if it is a low reactor on the supposition that it is an immune bird or a carrier of another disease.

In a brief discussion of the collection and transfer of blood to a laboratory, the authors point out that it is probably best to test just before the breeding season in order not to throw the birds out of production. While a fatty serum may be corrected to some extent by withholding feed for 18 to 36 hours before bleeding, this will influence the egg production, and it is best to control this trouble by reducing the amount of phenol in the test fluid.

[Bacillary white diarrhea investigations at the Illinois Station] (*Illinois Sta. Rpt. 1926, pp. 76, 77*).—Thirty flocks among the 334 flocks in 68 counties in the State that were given the serum agglutination test for bacillary white diarrhea were found free of the disease. Of all the blood samples tested from 49,056 chickens, 80.4 per cent gave negative and 17.2 per cent positive reactions. The making of the intradermal test was placed in the hands of 7 veterinarians, who tested 27,396 chickens, of which 15.2 per cent gave a positive reaction. In continuation of the studies on resistence by Roberts and Card (E. S. R., 56, p. 275), the mortality was found to be more than twice as high among chickens from random stock as it was among those produced from stock selected for resistence.

The therapeutic efficiency of avian diphtheria, roup, and bird pox vaccines and bacterins, N. J. Pyle (*Massachusetts Sta. Tech. Bul. 10 (1926), pp. 205–216, fig 1*).—In the investigations here reported, the author found a filtrable virus to be the cause of all three types of the disease. Several organisms were isolated from the lesions of avian diphtheria, diphtheritic roup, and pox, but they proved to be of no causative significance although prominent secondary invaders. The commercial stock powdered pox viruses were found to vary markedly in their ability to produce disease. The need of a method of standardizing the virus and vaccine was indicated. One, two, and three injections of the powdered pox virus vaccines failed to produce an absolute protection against artificial infection with homologous and heterologous viruses. Infection by contact occurred in 50 per cent of all cases. A slight improvement in the general condition of diseased birds followed the administration of powdered pox virus vaccine as a remedial measure. One attack of either or both types of the disease conferred an immunity of at least 50 days' duration against both types. Autogenous bacterins, when administered in the early stages of the disease, caused a general improvement in the health of the birds. As avian diphtheria and pox advance in severity, the egg production of the hens increases. With the injections of these bacterins, the data at hand indicate that the egg production is increased.

AGRICULTURAL ENGINEERING

[Agricultural engineering studies at the Arkansas Station] (*Arkansas Sta. Bul. 215 (1926), pp. 27–29, figs. 2*).—Studies of the cost of rice irrigation

ing plant. There is a wide variation in the power required for pumping and in the flow of water, and a close relation between the power used and the capacity of the pump for satisfactory pumping.

Experiments on the preservation of fence posts (E. S. R., 55, p. 75) indicated that lime sulfur spray solution has little value as a wood preservative. Ten per cent of the posts so treated were unfit for further service, and the sapwood was decayed to a depth of 0.75 in. Inspection of steel posts after 4 years' service showed considerable rust on the painted specimens, while the galvanized posts were in good condition. Of 148 butt treated, open tank process, creosoted green oak posts, 22 per cent were unfit for service after 5 years.

Tests to determine a practical method of treatment of wood with water-soluble toxic salts showed that on the average slightly more salt was absorbed by cooking the specimens for two hours at 180° F. than by soaking over night in cold solution. Most of the absorption occurred in the first hour of heating. Steeping in cold solution for as long as 24 hours per inch of thickness did not cause sufficient penetration, only about half as much dry salt being retained as in the heating process.

[Agricultural engineering studies at the Illinois Station] (*Illinois Sta. Rpt. 1926, pp. 121–133, 136, 137, figs. 3*).—The progress results of a number of agricultural engineering studies at the station are briefly summarized (E. S. R., 56, p. 280) which include data on electrically driven equipment, farm septic tanks, methods of working large teams, plow draft, terracing, waste caused by inefficient threshing, the use of the combine for soy bean harvesting, and seed cleaning.

Some of the outstanding results obtained are that the 2-chamber septic tank is the best farm type. It was found that 7- and 8-horse teams will prove of practical size for plowing and other field work on many Illinois farms. Seven horses can be used to pull three 12-in. bottoms and 8 to pull three 14-in. bottoms with little if any more side draft than when 6 horses are used on two 14-in. bottoms. The larger team can apparently be driven quite as easily as 5 or 6 horses in tandem. Plow draft was found to vary under different rotations.

Blanket tests made in representative sections of the State showed threshing losses as high as 4.05 per cent for wheat and 10.28 per cent for oats. In 9 cases the adjustment of concaves reduced the loss and better feeding reduced the loss in 8 cases. An increase in cylinder speed, closing of wind boards, raising of tail boards, and other adjustments also gave results. The combine was found to give promise for soy bean harvesting, the loss of soy beans being much less than by any other method and the cost about one-third of that with the ordinary methods.

Surface water supply of St. Lawrence River basin, 1923 (*U. S. Geol. Survey, Water-Supply Paper 564 (1926), pp. IV+171, pls. 3*).—This report, prepared in cooperation with the States of Wisconsin, Ohio, New York, and Vermont, presents the results of measurements of flow made on streams in this basin during the year ended September 30, 1923.

Surface water supply of Hawaii, July 1, 1921, to June 30, 1922 (*U. S. Geol. Survey, Water-Supply Paper 555 (1926), pp. IV+177*).—This report, prepared in cooperation with the Territory of Hawaii, presents the results of measurements of the flow of certain streams and ditches in the Territory of Hawaii made during the year ended June 30, 1922.

Relations between quality of water and industrial development in the United States, W. D. COLLINS (*U. S. Geol. Survey, Water-Supply Paper 559 (1926), pp. IV+43, pls. 5, figs. 6*).—Data are presented on the subject indicating,

public supplies or from sources that yield water of the same quality as that of some of the large public supplies.

The flow of water through culverts, D. L. Yarnell, F. A. Nagler, and S. M. Woodward (*Iowa Univ. Studies Engin. Bul. 1 (1926), pp. 128, pls. 23, figs. 26*).—Studies conducted in cooperation with the U. S. D. A. Bureau of Public Roads are reported, the purpose being to determine (1) the quantity of water which will flow through culverts or sluiceways under levees of different materials, sizes, and shapes under conditions of actual use, (2) what conditions tend to increase or decrease such quantity, and (3) what principles should be followed in design to secure the greatest discharging capacity for the least cost. The results of 1,480 experiments on pipe culverts made of concrete, vitrified clay, and corrugated metal of 12, 18, 24, and 30-in. sizes, and 1,821 tests on concrete box culverts of sizes varying from 2 sq. ft. cross section to 16 sq. ft. cross section are analyzed. The tests were made on culverts flowing partly full and full with both a free and submerged outlet, and various types of entrances were used.

The discharging capacity of a culvert was found to depend primarily upon its cross section and the difference in water levels at the two ends. To obtain the maximum discharge the culvert must be so laid as to insure the full cross section being filled by flowing water. If a culvert is so laid that both its upstream and downstream ends are completely submerged, the amount of water which it discharges will be proportional to the square root of the difference in water levels at the two ends. It was found that the exact grade at which the *culvert is laid has no effect upon its maximum discharging capacity.*

The tests of pipe culverts showed that the coefficient of roughness *n* in the Kutter formula for the concrete pipe ranges from 0.012 for the 12-in. size to 0.013 for the 30-inch size, for the vitrified clay pipe from 0.01 to 0.013, and for the corrugated metal pipe from 0.019 to 0.023.

On the basis of these studies the formulas derived for culverts 30.6 ft. long with straight end wall entrances were as follows:

Concrete pipe with beveled lip end upstream:

$$Q=4.61\ D^{2.18}\ H^{0.50}$$

Concrete pipe with square cornered entrance:

$$Q=4.40\ D^{2.09}\ H^{0.50}$$

Vitrified clay pipe with bell end upstream:

$$Q=5.07\ D^{2.66}\ H^{0.50}$$

Corrugated metal pipe:

$$Q=3.10\ D^{2.51}\ H^{0.50}$$

The general discharge formulas derived for pipe culverts with straight end wall entrance and of any size and length, when flowing full, were as follows:

Concrete pipe, beveled lip entrance:

$$Q=\frac{A\sqrt{2gH}}{\sqrt{1.1+\frac{0.026\,L}{D^{1.3}}}}$$

Concrete pipe, square cornered entrance:

$$Q=\frac{A\sqrt{2gH}}{\sqrt{1+0.31\,D^{0.4}+\frac{0.026\,L}{D^{1.3}}}}$$

Vitrified clay pipe, regular bell end upstream:

$$Q=\frac{A\sqrt{2gH}}{\sqrt{1+0.023\,D^{1.9}+\frac{0.022\,L}{D^{1.6}}}}$$

Corrugated metal pipe:

$$Q=\frac{A\sqrt{2gH}}{\sqrt{1+0.16\,D^{0.6}+\frac{0.106\,L}{D^{1.2}}}}$$

In these formulas, Q=discharge in cubic feet per second, A cross sectional area of pipe in square feet, D=diameter of pipe in feet, L=length of culvert in feet, H=head on pipe in feet or the difference in the water level at the two ends of the culvert, and g=acceleration of gravity.

The following general discharge equations were developed for concrete box culverts with straight end wall entrances when flowing full:

Box culverts with rounded lip entrances:

$$Q=\frac{A\sqrt{2gH}}{\sqrt{1.05+\frac{0.0045\,L}{R^{1.25}}}}$$

Box culverts with square cornered entrances:

$$Q=\frac{A\sqrt{2gH}}{\sqrt{1+0.4\,R^{0.3}+\frac{0.0045\,L}{R^{1.25}}}}$$

in which the same symbols are used as in the pipe culvert formulas and the term R is the mean hydraulic radius of the culvert in feet.

Rectangular concrete box culverts were found to require more head to overcome friction than square concrete box culverts of the same area, and hence have a smaller carrying capacity provided the entrance losses are the same. The head lost in friction for culverts of the same area varied inversely with the hydraulic radius. However, the entrance losses on the rectangular culverts tested were less than those on the square culverts with the same area and type of entrance.

A detailed comparison and discussion is given of the results of the tests on different types of pipe and box culverts.

Public Roads, [November, 1926] (*U. S. Dept. Agr., Public Roads, 7 (1926), No. 9, pp. 177–192+[2], figs. 11*).—This number of this periodical contains the status of Federal-aid highway construction as of October 30, 1926, together with the following articles: Five Years of State Road Building and Its Results, by F. Page; An Unusual Construction Record, by C. F. Rogers; Modern Highway Traffic and the Planning of State Highway Systems, by J. G. McKay; The Use of Hiring Cars and Busses on Rural Highways, by H. R. Trumbower; and The Penetration of Wood Preservatives, by R. I. Rudolph.

Binder and knotter troubles, J. M. SMITH (*Alberta Univ., Col. Agr. Bul. 10, 2. ed., rev. (1926), pp. 78, figs. 74*).—This is the second revised edition of this bulletin (E. S. R., 54, p. 78).

Electric ploughing, R. B. MATTHEWS (*Engineering [London], 122 (1926), No. 3161, pp. 211–214, figs. 23*).—A critical analysis of the important features of electric plowing is presented.

Dissipation of heat by cast-iron water radiators, F. E. GIESECKE (*Heating and Ventilating Mag., 23 (1926), No. 6, pp. 67–72, figs. 9*).—Tests conducted at the engineering experiment station of the University of Texas are reported which

Choosing a home electric lighting plant, F. E. Fogle (*Michigan Sta. Quart. Bul., 9 (1926), No. 2, pp. 40–44*).—Factors to be considered in the selection of a home electric lighting plant are enumerated.

Septic tanks for farm sewage disposal, F. L. Cooper (*Colo. Agr. Col. Ext. [Bul.], 247–A (1926), pp. 16, figs. 8*).—Practical information on the planning and construction of small sewage disposal systems for Colorado farms is presented.

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in farm organization and management in agricultural economics at the Illinois Station, 1926] (*Illinois Sta. Rpt. 1926, pp. 97–120, figs. 6*).—The results obtained during the year in investigations in progress are summarized.

[*Cooperative farm management and farm accounting*, H. C. M. Case and M. L. Mosher].—The first year's records from 225 of the 239 farms in Livingston, McLean, Tazewell, and Woodford Counties in the cooperative farm bureau-farm management project are tabulated and discussed. These farmers lacked $382 of making 5 per cent on their investment after paying all expenses but without making any allowance for the labor of the operators. The 25 most profitable farms had an average of $2,320 left over to pay for the operators' labor and management after paying all expenses and allowing 5 per cent on the investment. The 25 least profitable farms lacked an average of $2,404 of making 5 per cent on the investment and had nothing to show for the operators' labor and management. The most profitable farms had an average total expense of $17.72 per acre and gross receipts of $37.83 per acre, as compared with $16.32 total expenses and $14.80 gross receipts for the least profitable farms. Yields of corn and oats were from 20 to 30 per cent greater and of wheat slightly lower on the most profitable than the least profitable farms. The most profitable farms had $4.80 per acre more invested in productive livestock, received $18.14 per acre higher returns from livestock, $43.19 greater returns for each $100 worth of feed fed, and $55.70 greater returns for each $100 invested in livestock. The utility type of corn and Iowar, Iowa 103, and Iowa 105 strains of oats gave the best yields.

[*Farm earnings*, H. C. M. Case, R. R. Hudelson, P. E. Johnston, and K. H. Myers].—A table is given showing by sections of one or more counties the type of farming, the investment per acre, and the rate earned on the investment in 1924 and 1925. The figures are based on 850 farm records in 14 sections in 1924 and 1,100 records in 25 sections in 1925. After deducting a conservative sum for the value of the operator's own labor, the average earnings in all the sections studied on the average capital invested was 6.2 per cent in 1924 and 5 per cent in 1925. Based on a survey of 113 farms in McLean County, it is estimated that the average earnings of all farmers of the State for the 2 years were 2 per cent lower than the figures given above.

[*Cost of production*, H. C. M. Case, R. H. Wilcox, and H. A. Berg].—The cost accounting investigations in Champaign and Platt and in Knox and Warren Counties were continued. The average costs of producing corn, oats, and winter wheat were 57 cts., 65 cts., and $1.12 per bushel, respectively, in Champaign and Platt Counties, and 47 cts., 39 cts., and $1.13 per bushel, respectively, in Knox and Warren Counties, the yields being 51.7, 30.3, and 21.1 bu., respectively, in Champaign and Platt Counties, and 60, 52.3, and 21.4 bu., respectively, in Knox and Warren Counties. Soy beans in Champaign and Platt Counties yielded an average of 20.5 bu. per acre at an average cost of $1.25 per bushel. The cost per 100 lbs. of pork produced was $10.69 in Champaign and Platt Counties, and $9.24 in Knox and Warren Counties; per 100 lbs. of beef $15.76 and $17.30,

On the 16 farms in Champaign and Piatt Counties the costs of production per bushel varied from 45 to 81 cts. for corn; from 93 cts. to $2.27 for wheat; from 47 to 79 cts. for oats; and from 99 cts. to $2.34 for soy beans. The cost of producing 100 lbs. of pork varied from $7.83 to $22.34, and the cost of horse labor ranged from 9 to 23⅓ cts. per hour.

[*Farm power costs*, R. C. Ross and R. I. Shawl].—The yearly use per farm and cost per hour of use of 2-plow tractors during 1925 were 300 hours and 79 cts., respectively, on 68 Champaign County farms, and 304 hours and 76 cts., respectively, on 28 Knox and Warren County farms. Three-plow tractors were used on an average of 237 hours at a cost per hour of $1.39 on 33 Champaign County farms, and 374 hours at an average cost of $1.13 on 24 Knox and Warren County farms. Horse labor on 16 Champaign and Piatt County farms averaged 793 hours per year at a cost of 14.6 cts. per hour. The percentage of different kinds of work done by 2-plow and 3-plow tractors for the different counties is shown.

[*Farm grain profits*, L. J. Norton].—The value of corn gradually increased from 1860 to 1917, but the increase has not continued since 1917. Production and prices of corn since 1900 indicate that a change of 1 per cent in production causes a change of 1.7 per cent in price in the opposite direction.

Years of high wheat prices were found to be poor years to store, as two poor harvests usually do not come in succession. It was also found that on an average it is not profitable to store for 12 months during years of low prices.

[*Different wheat areas of the State*, C. L. Stewart, L. J. Norton, O. L. Whalin, and L. F. Rickey].—A survey showed that the southern part of the State shipped soft wheat exclusively, that the northern part shipped chiefly hard wheat, while the central part shipped both hard and soft wheat and a considerable amonnt of mixed wheat.

A comparison of the prices of hard wheat at Chicago and soft wheat at St. Louis from 1914 to 1924 indicates that there was no premium on soft wheat at harvest, but that the price advanced until there was an average premium of 11 cts. per bushel in January.

Rural economics and sociology (*Arkansas Sta. Bul. 215 (1926), pp. 60–64*).—Results of work in rural economics and sociology are given.

Farm incomes and the standard of living.—Records of a year's business on 903 farms were obtained. The size of the farm business measured in terms of the amount of work accomplished was found to be the most important factor in determining profits, as more efficient utilization of land, labor, and capital was possible on the larger size farm. The better paying farms had a larger acreage in cash crops and slightly higher yields than those that failed to make money.

Factors of practical farming.—The accounts kept in 1925 of about 100 farms were compiled. The average income above farm expenses, not including family and personal expenses or interest on mortgages, was $759. Measuring the size of the farms on the basis of days of labor required, the larger farms made more than the smaller ones. Farms deriving from 15 to 50 per cent of their income from cotton made more than other farms, while those deriving more than 50 per cent from livestock, dairy, and poultry made less than other farms. Farms with yields higher than the average State yields and those with the higher gross receipts per worker made the most money.

Farming in the Big Bend country, W. J. Spillman (*Washington Col. Sta. Pop. Bul. 135 (1926), pp. 4–72, figs. 11*).—Information is given as to the soil, climate, and other natural factors; the results obtained at the experiment stations in the area with varieties of wheat, methods of tillage, etc.; the farm organization and practices of the most successful farmers; and the present and comparative economic conditions of the section. Systems of farming and methods

Returns from the Arkansas radish crop in 1926, C. O. BRANNEN and J. A. DICKEY (*Arkansas Sta. Bul. 214 (1926), pp. 4*).—The sale value per acre and bushel and the itemized cost of producing and marketing radishes in 1926 are given. The net returns for labor, use of land, overhead, etc., were $31.52 per acre and 25 cts. per bushel in the southwestern counties, and $47.03 per acre and 72 cts. per bushel in the northeastern counties.

Woodlot taxation in Michigan, K. DRESSEL (*Michigan Sta. Quart. Bul., 9 (1926), No. 2, pp. 44–47*).—Up to 1925, 50 woodlot owners in 22 counties had taken advantage of the woodlot tax act of 1917, permitting woodlot owners, in lieu of taxes on the existing valuation of the land, to pay taxes on a valuation of $1 per acre and a 5 per cent cutting tax on the actual stumpage value of timber removed, except for the use of the owner or tenant. The reduction of tax valuations of lands listed under the act are summarized.

Crops and Markets, [December, 1926] (*U. S. Dept. Agr., Crops and Markets, 6 (1926), Nos. 24, pp. 369–384; 25, pp. 385–400; 26, pp. 401–416; 27, pp. 417–440*).—The usual weekly tabulations, notes, and summaries are given for the period November 29 to December 31 for livestock, meats, and wool, fruits and vegetables, dairy and poultry, grain, hay, feed, cotton, and foreign crops and markets. This series of weekly reports has been discontinued with the above numbers.

Cotton facts, compiled by A. B. SHEPPERSON, rev. by C. W. SHEPPERSON (*New York: Shepperson Pub. Co., 1925, 50. ed., rev. and enl., pp. 255, pl. 1, fig. 1*).—A revised edition of the work previously noted (E. S. R., 45, p. 342). Statistics are included as to crops, receipts, stocks, exports, imports, visible supply, sales, consumption, and manufacturing output of cotton and cotton products.

Report on the grain trade of Canada . . . 1925, W. DOUGAN and E. A. URSELL (*Canada Bur. Statis., Rpt. Grain Trade Canada, 1925, pp. 215, figs. 5*).—This report succeeds an earlier one (E. S. R., 54, p. 788).

Report on the marketing of pigs in England and Wales (*[Gt. Brit.] Min. Agr. and Fisheries, Econ. Ser. 12 (1926), pp. VI+103, pls. 22*).—A description is given of the methods employed and the services involved at each stage of the marketing of pigs in England and Wales. The market requirements and causes of price fluctuations are discussed. Progress in replacing the £57,000,000 worth of pig meat imported in 1925 was found to be practicable in two directions, viz, by filling the gap in the fresh-pork market caused by the embargo on imported carcasses and by supplying mild-cured Wiltshire side bacon and other cuts, of which about £23,500,000 worth were imported.

Greater uniformity and higher quality of supplies, breeding to meet market requirements, a body for coordinating the efforts of producers and distributors, cooperative marketing, uniform classification for price recording and improved dissemination of market information, and payment on the basis of quality are suggested as means of improving marketing conditions.

Report on the marketing of poultry in England and Wales (*[Gt. Brit.] Min. Agr. and Fisheries, Econ. Ser. 11 (1926), pp. VI+122, pls. 32, figs. 4*).—The results of a detailed investigation into the marketing of poultry in England and Wales are given. The methods employed and the services involved at each stage are reviewed, and comparison made with corresponding activities in other countries. Suggestions are made as to possible improvements which will enable home producers to meet the competition of other countries.

Expense factors in city distribution of perishables, C. E. ARTMAN (*U. S. Dept. Agr. Bul. 1411 (1926), pp. 36, figs. 13*).—This study is based on approximately 14,000 individual price records for 14 commodities collected from February, 1923, to May, 1924, from 50 retail stores in the New York metropolitan area. The purchasing habits of consumers, i. e., the prevailing size of the

individual retail sale; the special services involved in the delivery of goods and extension of credit; and the form of organization or management of the retail store were found to be the features of outstanding significance in determining the expense of distributing perishable foods to city customers.

The percentage of margins between mean wholesale and retail prices for the 14 commodities varied from 37 to 63, the weighted mean being 45. The value of the standard retail sale varied from 20.3 to 27.8 cts., averaging 25.3 cts., and the price spread per standard retail sale from 9.9 to 12.8 cts., averaging 11.3 cts. Differences in margins were found to be directly due to differences in size of the retail sale, and the practice of marking retail prices so as to obtain for different articles a fairly constant money spread per sale, regardless of the size, explains the differences in percentage margins. The jobbers' and retailers' portions of the price spreads of standard retail sale for unit stores varied from 1.6 to 3 cts., averaging 2.1 cts., and from 8.7 to 10.9 cts., averaging 9.7 cts., respectively. The price spread in chain stores was 43 per cent below that of typical unit stores and 31 per cent below that of unit cash-carry stores. In unit stores the spread in cash-carry stores was 9 per cent below that of cash-delivery stores and 23 per cent below that of credit-delivery stores, and that of cash-delivery stores was 16 per cent below that of credit-delivery stores. The weighted mean value of standard retail sales of 7 of the 14 commodities was 20.2 cts. for chain stores, 23.3 cts. for cash-carry stores, 24.9 cts. for cash-delivery stores, and 27 cts. for credit-delivery stores.

The analysis of the implications in commodity differences through which the theory of a constant price spread per retail sale was developed is presented.

Consumer habits and preferences in the purchase and consumption of meat, K. B. Gardner and L. A. Adams (*U. S. Dept. Agr. Bul. 1443 (1926), pp. 64*).—This bulletin is the third of the series on retail marketing of meat previonsly noted (E. S. R., 56, p. 288). The aim of the study was to obtain information regarding the purchasing habits of housewives; their knowledge of grades, quality, and cuts of meat; their preferences for various kinds and cuts of meat; and the use of meat in the household. Housewives representing households totaling 20,744 persons in 16 representative cities of the United States were interviewed. Of the households represented, 2,912 were American white, 400 colored, and 1,154 foreigners. The replies to the several questions in the questionnaire used are tabulated and analyzed, and the results are summarized under consumption, purchasing, advertising, and consumer knowledge of meat quality and cuts. A copy of the questionnaire used is included.

Possibilities and limitations of cooperative marketing, F. L. Thomsen and H. C. Hensley (*Missouri Sta. Circ. 150 (1926), pp. 4*).—This circular briefly discusses the benefits to be derived from cooperative associations for marketing farm products.

Co-operative ideals and problems, A. Örne, trans. by J. Downie (*Manchester: Co-operative Union Ltd., 1926, pp. [XIX+143, fig. 1*).—This book, translated from the Swedish, discusses some of the ideas and problems affecting the consumers' cooperative form of enterprise. Much of the material presented is drawn from the experiences of the Swedish Cooperative Union and the Swedish cooperative societies.

Price fixing by governments 424 B. C.–1926 A. D.: A selected bibliography, including some references on the principles of price fixing, and on price fixing by private organizations, compiled by M. G. Lacy, A. M. Hannay, and E. L. Day (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 18 (1926), pp. [3]+149*).—This is a selected bibliography in mimeographed form bringing that previously noted (E. S. R., 49, p. 559) down to date and enlarging it by

and State statutes of the United States have been consulted, and the laws of approximately 60 foreign countries cited from official sources or the information supplied from secondary sources. Some references are included on the principles of price fixing and on price fixing by private organizations.

Needed readjustments in rural life: Proceedings of the Eighth National Country Life Conference (*Natl. Country Life Conf. Proc., 8 (1925), pp. VII+158, pl. 1*).—Addresses and papers presented before the conference, held at Richmond, Va., in 1925, were Needed Readjustments in Rural Life Today, by K. L. Butterfield; Public Welfare and Democracy, by H. W. Odum; The Farmer's Adjustments to the Commercial World, by C. C. Taylor; The Canadian Situation, by J. B. Reynolds; The Family and Private Ownership, by E. V. O'Hara; and Economic Effects of Belief in Transmigration, by S. Higginbottom. Farmers' income, farmers' standards of living, and the adjustments that should be made by farmers' cooperative organizations, community organizers, educators, and religious workers formed the chief topics of the discussions at the conference.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

A handbook of educational associations and foundations in the United States (*U. S. Bur. Ed. Bul. 16 (1926), pp. III+82*).—An alphabetical list with cross references of the association and foundations in the United States engaged in the promotion of education. It includes national associations and foundations, some important sectional associations, general State associations, and a few international organizations having offices in the United States.

The place of vocational agriculture in the present agricultural situation, C. H. Lane (*Fed. Bd. Vocat. Ed. Monog. 3 (1926), pp. 14*).—This monograph outlines some of the fundamentals of efficient farming which should be included in programs for systematic vocational education in agriculture.

The folk high schools of Denmark and the development of a farming community, H. Begtrup, H. Lund, and P. Manniche (*London: Oxford Univ. Press, Humphrey Milford; Copenhagen: Arnold Busck, 1926, pp. 168, pls. 2*).—A brief description is given of the origin, development, purposes, and results of the folk high schools and the International People's College of Denmark.

The story of the women's institute movement in England and Wales and Scotland, J. W. Robertson Scott (*Idbury, Kingham, Oxon: Village Press, 1925, pp. XV+290, pls. 17, figs. 4*).—A historical account is given of the introduction and growth of this movement, the object of which is "to improve the conditions of rural life and to provide opportunities for mutual help and intercourse."

Report of H. M. inspectors on the educational work of women's rural institutes (*London: Bd. Ed., 1926, pp. 22*).—This report of the inspectors of the Board of Education deals with the history and organization of women's rural institutes in England and Wales and the educational work carried on under the various county education authorities in connection with such institutes.

Source book for the economic geography of North America, C. C. Colby (*Chicago: Univ. Chicago Press, 1926, pp. XXII+549, pls. [6], figs. [89]*).—A collection of source material on the economic geography of the United States, Canada, Mexico, and Alaska, prepared for use in a course on the economic geography of North America in the University of Chicago. The material is organized on a regional basis.

The botany of sugar cane [trans. title], E. Mameli de Calvino (*Chaparra Agricola, 1 (1924), Nos. 4, pp. 3–6, pls. 2; 5, pp. 20–23; 6, pp. 15–18; 7–8, pp. 13–17; 1 (1925), Nos. 9, pp. 13–16, pls. 2; 10, pp. 9–23, figs. 11; 11, pp. 4–17, figs. 20; 12, pp. 3–17, figs. 10; 2 (1925), No. 1–2, pp. 8–20, figs. 7*).—The several sections (mainly descriptive) above indicated are intended to comprise, with a

An animal feeding experiment, showing the effect of deficient diet on growth, G. SPENCER (*Austin: Tex. Univ., Div. Ext., Nutrition and Health Ed. Bur., [1925?], pp. 67, figs. 17*).—Directions and information are given for conducting a simple experiment with rats to demonstrate the relative growth-promoting value of milk as compared with candy, chili, coffee, and a bottled beverage. It is planned for use in high-school classes studying nutrition under a biology or home economics teacher, and in connection with health program work in the grades. An account is included of how the experiment can be used in connection with a health program in extension work.

Agricultural journalism, N. A. CRAWFORD and C. E. ROGERS (*New York: Alfred A. Knopf, 1926, pp. VII+300, pls. 5, figs. 3*).—This textbook applies the fundamental principles of journalistic writing to agricultural and other rural subject matter. It is arranged for use either as a basic text in an extended course, or as a manual in a brief course covering only the rudiments of agricultural writing. Each chapter is followed by questions and assignments.

FOODS—HUMAN NUTRITION

Nutritive value of Oriental foods, A. OHN (*Western Dietitian, 1 (1926), No. 6, pp. 23–25, 37, 38, figs. 3*).—This paper consists of a comparison of Oriental with Occidental food habits, with emphasis on some of the advantages of Oriental methods of food preparation and preservation. Data on the chemical composition and nutritive value of typical Oriental foods are tabulated, and a comparison is given of the distribution of foods in the middle-class Chinese diets of north China as reported by Adolph (E. S. R., 54, p. 591), with estimated values for south China. The latter show a slightly lower consumption of cereals and a higher consumption of fruits and vegetables, meats and fish, and fats and sugar.

Studies in Chinese economic botany, C. Y. SHIH (*Chinese Econ. Mo., 2 (1925), Nos. 9, pp. 24–29, figs. 4; 10, pp. 36–43, figs. 3; 11, pp. 23–36, figs. 3; 12, pp. 37–44; 13, pp. 30–44, fig. 1; 15, pp. 38–53, figs. 3*).—This is a compilation of information on methods of cultivating some of the common food plants of China and recipes for their use in the preparation of various food products. The materials include soy beans and other varieties of beans, peanuts, Chinese cabbage, rape, mustard, spinach, parsley, watercress, onions, leeks, garlic, peppers, various cucurbitaceous plants, roots and storage stems, fruits, nuts, and cereals. A summary of the Chinese, Latin, and English names of the different products discussed is appended.

Influence of granulation on chemical composition and baking quality of flour, J. H. SHOLLENBERGER and D. A. COLEMAN (*U. S. Dept. Agr. Bul. 1463 (1926), pp. 36*).—In this investigation of the optimum degree of fineness of flour particles from the standpoint of chemical composition and breadmaking qualities, three methods were used to obtain samples of flour of varying fineness. In the first, portions of coarse middlings and flours were ground on smooth rolls of a laboratory mill 1, 4, 10, and 20 times without sifting; in the second, middlings were ground in the same way to pass through 8xx, 12xx, 20xx, and 25xx silk cloth; and in the third, coarse middling stocks were sifted in sieves covered with 8xx, 10xx, 12xx, 16xx, 20xx, and 25xx silk bolting cloth. All of the samples thus obtained were subjected to the usual flour analyses, and special studies were made of the quality of the gluten in the excessively ground samples, the quantity and quality of the gluten in different sized flour particles, and the diastatic action of the flours.

The results obtained confirm those of previous investigations, such as that of Alsberg and Griffing (E. S. R., 55, p. 504), that excessive [illegible]

the chemical composition and baking quality of the flour unfavorably. It is noted, however, that under commercial conditions the grinding would probably never be excessive enough to bring about marked changes in the flour except in its fineness and whiteness. The most important chemical changes resulting from excessive grinding (methods 1 and 2) were a deterioration in the quality of the gluten and an increase in the diastatic action of the starch. In baking results the most marked effect was an increase in water absorption and deterioration in the color of the crumb. Of the samples obtained by the third method, the smallest sized particles were found to contain less protein and wet and dry gluten than the coarser particles, and the quality of the gluten was less good. With the soft red winter wheat the smallest sized particles had lower and with the hard wheat higher ash content. The smallest particles usually contained the least amount of gasoline-soluble pigment. The particles of intermediate size gave the best appearing loaf and those of the smallest size loaves of very inferior quality. It is noted, however, that satisfactory pie crust can be made from the very fine flour, suggesting the possibility of separating flour for the two purposes.

Numerous tables give the detailed results of the chemical and baking tests.

A study of the use of Missouri soft wheat flour in making light bread, E. M. Davis and J. A. Cline (*Missouri Sta. Research Bul. 87 (1926), pp. 5–47, figs. 45*).—In this publication are given the details of the experimental work upon which were based the formulas and directions for making bread from Missouri soft wheat flour with the use of compressed yeast (E. S. R., 53, p. 58) and dried yeast (E. S. R., 55, p. 291), together with the results of a similar study of the use of liquid yeast.

Good results were obtained with the use of only a small amount of liquid yeast and the addition of potato water or buttermilk as the rest of the liquid. The best loaf of the series was obtained with potato as the gelatinized starch for the starter, as suggested in the previous study, and potato water as the liquid. Corn sirup did not give as good results as cane sugar. Excellent bread was obtained with apple and apple water with the liquid yeast. The bread thus made is said to have a fine silky texture, excellent volume, and to keep fresh longer than any of the other breads made from Missouri soft wheat flour.

A review of the literature on breadmaking with soft wheat flour, a short bibliography, and numerous photographs of the breads made by the different processes are included.

A bakery infection with Monilia sitophila, G. B. Reed (*Abs. in Phytopathology, 14 (1924), No. 7, p. 346*).—It is claimed that bread produced from a small bakery in eastern Ontario when kept for four or five days developed a deep shell pink color throughout the loaf. The infection was due to *M. sitophila*.

The dietetic value of oatmeal proteins, G. A. Hartwell (*Biochem. Jour., 20 (1926), No. 4, pp. 751–758, figs. 3*).—On a ration prepared by heating 100 gm. of oatmeal, 2.88 gm. of salt mixture, and 14 gm. of butter with 500 cc. of water, as in the method previously described (E. S. R., 55, p. 411), rats grew well although not so rapidly as control animals on a mixed diet of kitchen scraps, bread, and milk. The ration proved less satisfactory for gestation and lactation. The litters were small, many of the young were below average weight at birth, and not all were raised. The growth of the young was also slower when the mothers received this ration than either raw or cooked oatmeal and water. This observation, together with the fact that better growth in the suckling young was secured when casein, gluten, gelatin, or egg albumin was added to the ration of the mother, is thought to indicate that oatmeal proteins are of good quality, but that the amount present in the ration was too low for the

[Studies at the Illinois Station on milk composition and energy] (*Illinois Sta. Rpt. 1926, pp. 91, 92*).—From a study by O. R. Overman and F. P. Sanmann of the relation of the composition of milk to its energy value as determined on 212 samples of milk ranging in fat content from 2.68 to 7.59 per cent, formulas have been prepared for computing the heat of combustion of a quart of milk as follows: If the percentages of fat (A), protein (B), sugar (C), total solids (D), and specific gravity (E) are known, the formula is F (calories per quart of milk) $=52.78A+16.41B+37.87D+46.91E-2.75C-57.70$. If the percentages of fat, protein, and sugar are known, the formula $F=90.67A+54.27B+26.73C+55.44$ should be used. If only the percentage of fat is known, the formula $F=113.7334\ (A+2.4404)$ should be used. If only the percentage of fat is known and the metabolizable energy is wanted, the formula $F_M=105.287\ (A+2.4185)$ should be used.

Acidophilus milk proves desirable beverage (*Illinois Sta. Rpt. 1926, pp. 95, 96*).—The method used by M. J. Prucha and J. M. Brannon in the preparation of acidophilus milk is as follows: Skim milk of good quality is pasteurized in a glass-lined vat at 175° F. for 30 minutes, cooled to 100° and allowed to stand for 3 or 4 hours, repasteurized under the same conditions, cooled to from 100 to 102°, and inoculated with a strong acidophilus culture, using at least 3 per cent of inoculum. When an acidity of from 0.5 to 0.6 per cent is reached the milk is cooled to about 60° and cream is added to make a fat content of about 1 per cent, together with from 5 to 10 per cent of a good lactic acid starter to improve the flavor. The milk is finally passed through a homogenizer and over a cooler.

Fruit jellies—the rôle of pectin, P. B. Myers and G. L. Baker (*Delaware Sta. Bul. 147 (1926), pp. 15–17*).—In this progress report on the study of fruit jellies (E. S. R., 55, p. 385), data are summarized on the properties of solutions of commercial grades of citrus and apple pectins of varying degrees of purity.

With increasing purity of the pectin there was an increase in the viscosity and the H-ion concentration of the pectin. The jelly strength at the H-ion concentration corresponding to the optimum point of jelly formation varied directly with the viscosity of the pectin solution regardless of its source, indicating that the jelly strength at the optimum point varies with the purity of the pectin.

It was found possible to remove a small percentage of impurities from the pectin by successive precipitations with alcohol, but beyond a certain point the ash remained fairly constant, indicating a possible combination of pectin with some of the impurity represented by the ash. Still more ash could be removed by treating the pectin with acid before precipitation with alcohol and by electrolyzing the solution, using diaphragms impermeable to the pectin. After electrolysis the H-ion concentrations of the various pectins were practically the same if at the same degree of purity.

It is noted in conclusion that when acid is added to a pectin solution the acid radicle does not combine with the pectin as stated in an earlier paper. "It has been definitely established that the acid radicle unites with metallic ion, either adsorbed by the colloidal pectin or actually in the pectin molecule, to form salts, while the hydrogen ion of the acid simply replaces the metallic ion."

The science of making sauerkraut, F. W. Fabian (*Michigan Sta. Quart. Bul., 9 (1926), No. 2, pp. 50, 51*).—Simple directions are given for the home manufacture and preservation of sauerkraut. In the author's opinion the best means of securing the desirable flavor is by the use of a homemade starter prepared by adding to a shredded cabbage 2.5 per cent of its weight of common salt and allowing it to ferment at 80° F. for several days in a clean suitable container properly weighted. If at the end of this time the starter has the desired

the container is being filled, 1 gal. of the starter being sufficient for about 25 gal. of the cabbage. The same proportion of salt and the same temperature are used for the fermentation of the large batch as for the starter. If the starter does not acquire the desired flavor it should be thrown away and another prepared.

To prevent the growth of lactic acid-destroying organisms, the sauerkraut should be canned or sealed by pouring melted paraffin over the surface of the liquid.

Remedies being found for canned corn defects (*Illinois Sta. Rpt. 1926, pp. 161, 162*).—In an experiment by W. A. Huelsen a comparison of the brown discoloration due to tin sulfide and the black due to iron sulfide in high protein and low protein corn packed in cans with different weights of tin plate coating showed that the protein content is one of the factors largely responsible for the black discoloration. In cans having no tin coating the black discoloration was about 25 times as great with the high protein as with the low. With increasing weight of tin in the coating there was a decrease in the black discoloration, but in the high protein corn an increase in the brown.

Concerning commercial varieties of dextrin and their use in artificial diets for the biological analysis of foods [trans. title], L. Randoin and R. Lecoq (*Jour. Pharm. et Chim., 8. ser., 4 (1926), No. 7, pp. 289–294, figs. 2*).—Attention is called to observed differences in the growth curves of rats on diets identical except for dextrin, which in one case was white and in the other a light brown. On supposedly adequate diets there was noted a loss in weight with the white dextrin and gain at the usual rate with the brown. The difference is attributed to difficulty in digesting the white dextrin, which more nearly approached starch in its properties. In the brown dextrin it was assumed that the starch had been more completely broken down, with increased digestibility. It is recommended that if dextrin is to be used in basal diets for nutrition experiments preference should be given to the light brown form.

Calcium balance with hydrochloric acid milk, R. G. Flood (*Amer. Jour. Diseases Children, 32 (1926), No. 4, pp. 550–553*).—Calcium metabolism experiments were conducted on normal and rachitic infants receiving first a sweet milk formula and then the same formula with the substitution of N/10 HCl for the water of the previous formula.

In the normal subjects there was no variation in the calcium retention with sweet or acidified milk, but in the rachitic subjects the retention was much lower on the sweet milk than on the acidified milk, the difference increasing with the severity of the rickets. This is thought to explain the favorable action of hydrochloric acid milk in the prevention and cure of rickets. The prophylactic action is attributed, first, to the low buffer content of the hydrochloric acid milk which enables the utilization of a higher percentage of fat and incidentally vitamin D and, second, to the high absorption of calcium on account of the change from insoluble to soluble salts.

Attention is also called to the fact that infants suffering from chronic infections are especially prone to rickets, and that such conditions are apt to be accompanied by a moderate hypochlohydria which is counteracted by the acidity of the hydrochloric acid milk.

The antirachitic vitamin (*Brit. Med. Jour., No. 3430 (1926), pp. 606, 607*).—An editorial discussion based upon recent literature emphasizing the greater relative importance of sunlight than of diet in the prevention of rickets.

Contributions to tropical physiology, with special reference to the adaptation of the white man to the climate of North Queensland, E. S. Sundstroem (*Calif. Univ. Pubs. Physiol., 6 (1926), pp. 216, figs. 26*).—The exten-

North Queensland, situated 19° south on the coastal belt of the Australian Tropics and inhabited by a pure white race. The climate is thought to be fairly representative of wide expanses of tropical country. The average humidity is high (75 per cent) and the temperature range from 20 to 28° C. by dry bulb and 17 to 25° by wet bulb thermometer. The studies reported included analyses of the blood of 45 individuals for sugar, nonprotein nitrogen, phosphorus, and lipoid constituents; determinations of water regulation and acid base equilibrium in a few subjects; basal metabolism and dietary studies and urinary analyses; studies of the growth of children, growth of hair and nails, and growth of rats; measurements of cooling power; determinations of red and white blood corpuscles; and reaction times to stimuli.

The blood studies appeared to indicate that a tropical environment predisposes to a decrease in the blood sugar level, an increase in the level of nonprotein nitrogen primarily due to lack of water for proper excretion, a decrease with increasing time spent in the Tropics in the phosphorus and total fatty acids, an increase in fat, a somewhat wider range for cholesterol and the ratio lecithin to cholesterol, and a higher concentration of total solids. In general the changes were more noticeable in women than in men and in subjects born in the Tropics than those coming from cooler climates. The necessity of copious water drinking is thought to be indicated by the tendency to higher concentration of most of the blood constituents and the tendency to alkalosis.

Basal metabolism determinations with the Zuntz portable respiration apparatus were conducted on 8 male and 7 female subjects, 29 determinations being made in all, including 8 on the author on consecutive days. The minimum, maximum, and average basal metabolic rates were 25.5, 36.1, and 31 calories per square meter of body surface for the males and 22.1, 33.8, and 27.8 calories, respectively, for the females. Physically active individuals showed a relatively high basal metabolism. There were decided fluctuations from day to day, apparently due to variations in relative humidity.

The dietary studies were conducted for a week on a man, a woman, and a 9-year-old child weighing 66.6, 70.4, and 32.8 kg., respectively. The daily calorie intake was 3,044 for the man, 2,374 for the woman, and 2,078 for the girl. The water intake was 2,650, 1,730, and 1,760 cc. daily and the nitrogen balance −0.15, +0.56, and +1.28 gm., respectively. The balance of the phosphorus was positive and sulfur negative for all of the subjects.

Growth studies were made at monthly intervals for 6 months or more on 107 boarding school girls. Data are tabulated for the average height and weight and weight-height ratios from the ages of 8 to 17 years, inclusive. The data for 10 to 15 years are thought to be sufficiently reliable for statistical use. The rate of growth was found to be more rapid than for girls of the same stock in temperate climates, but no differences in the build as judged by the ratio of weight to height were observed. A seasonal rhythm in growth was demonstrated.

Growth standards: Height, chest-girth, and weight for private school boys, H. Gray and F. Fraley (*Amer. Jour. Diseases Children, 32 (1926), No. 4, pp. 554, 555*).—The data for ideal standards of height, chest, and weight for age and weight for height for boys in private boarding schools in the country and in country day schools (E. S. R., 46, p. 563) have been extended to a total of 1,016 records by measurements from two schools. The new data confirm and smooth out the earlier tentative standards. The figures for stature and chest girth are higher than those reported by Baldwin for California gifted children,[3] but represent a strikingly slender type in weight for height.

[3] Anthropometric measurements, B. T. Baldwin. In Genetic Studies of Genius, I., L. M.

Metabolism of undernourished children, I–III, C. C. WANG, M. FRANK, B. B. HAYS, and R. KERN (*Amer. Jour. Diseases Children, 32 (1926), Nos. 1, pp. 63–71, fig. 1; 3, pp. 350–366, figs. 3*).—An extensive investigation of undernourishment in children with a view to determining whether occasional failures to gain in nutrition classes are due to metabolic abnormalities has been undertaken at the Nelson Morris Memorial Institute for Medical Research of the Michael Reese Hospital, Chicago, under the auspices of the Elizabeth McCormick Memorial Fund. The first three phases of the investigation are reported in the papers noted below.

I. *Gain in weight.*—This report deals with 33 underweight children and 9 normal children from 4 to 13 years of age who remained in the hospital under constant supervision for periods varying from 2 weeks to 5 months. The children, most of whom came from Jewish, Polish, Irish, and Italian families, were selected for the most part from those failing to gain weight while attending nutrition classes. Twenty-two of them were more than 10 per cent and all more than 5 per cent below the Baldwin-Wood normal figures for age and height and nearly all were below normal height for age by the Woodbury standards. In general, the diet given at the hospital provided a caloric intake desirable for a child of the same age and normal height and weight and included plenty of fresh vegetables, fruit, and milk.

Four of the children, including 3 of normal weight, neither gained nor lost weight and 2 lost slightly during their stay at the hospital, but no child remaining longer than 2 weeks failed to gain. Eleven had reached normal weight and only 8 were more than 10 per cent below normal on discharge. Among the underweight children, those below 6 years of age showed the greatest gains, while in the normal children the 8-year-old group gained more rapidly than the 4- and 5-year group. The degree of underweight apparently had no effect upon the rate of gain. The most rapid gain was made by a 5-year-old girl who changed from 17.7 to 1.5 per cent underweight in 4 weeks, and the greatest total gain by a 10-year-old girl who gained more than 35 per cent of her weight on entry in 23 weeks.

In discussing the apparent causes of malnutrition among the subjects studied, racial emotional characteristics and poor home conditions leading to bad food habits were considered important factors. Slow eating resulting in inability to finish a meal in the usual time, apathy toward normal play and overexcitement when drawn into it, and poor dental hygiene are cited as individual variations from the normal.

II. *Basal metabolism.*—Basal metabolism determinations are reported for all but one of the subjects of the previous study. Benedict's cot chamber with universal respiration apparatus was used, the determinations being made in duplicate on 3 consecutive days. The values obtained were compared with the Benedict-Talbot standards for age, weight, and height, a 10 per cent decrease being made since all records in the present study were made with the children awake. All of the children came within the normal limits. The metabolism decreased with increasing underweight when computed on the basis of height and increased when computed on the basis of weight. The food intake showed a rather constant level of 1.7 times the caloric value of the basal metabolism.

III. *Urinary nitrogen with special reference to creatinine.*—This paper, which opens the discussion of the substance metabolism of the above subjects, deals with the urinary nitrogenous constituents, particularly creatinine, on

controlled diets. Nine boys and 17 girls served as subjects for the creatinine determinations and 14 boys and 17 girls for the total and ammonia nitrogen. The results obtained are summarized as follows:

"The creatinine coefficients of 26 normal and underweight children ranged from 5.5 to 9.5, with averages of 7.1, 7.4, 7.7, 7.9, and 7.5 for vigorous normal children, normal in weight, 5.1 to 10 per cent underweight, 10.1 to 15 per cent underweight, and more than 15 per cent underweight, respectively. These children showed no signs of diminished creatinine excretion up to 15 per cent below normal weight. Creatinine excretion remained very constant for the same child from time to time. Creatinine nitrogen increased with increasing body weight and likewise with age, although the latter factor may be secondary to the former. Creatine occurred in all children examined, and indications are that it varies according to protein intake. Total and ammonia nitrogen in the urine were approximately the same in all groups."

Goiter in children in New York City, F. Cohen (*Amer. Jour. Diseases Children, 31 (1926), No. 5, pp. 676–692, figs. 3*).—This paper includes the report of a survey of the extent of goiter among schoolgirls in New York City previously noted from a paper by Goldberger and Aldinger (E. S. R., 54, p. 295), and of a similar survey covering the examination of 783 boys from the fifth grade through the first year of high school in Manhattan.

Of the boys, 94.6 per cent had normal thyroid glands, 4.9 per cent slight enlargements, and 0.5 per cent moderate enlargements. The highest incidence of enlargement was at the time of puberty, from the thirteenth to the fifteenth year. The rate of slight enlargement among the boys was about one-third and moderate enlargement one-fourth that among the girls. There were no cases of marked enlargement of the thyroid among the boys as compared with 0.4 per cent among the girls.

The author is of the opinion that the incidence of goiter in boys and men is an important index of the degree to which a definite region is goitrous. As thus judged, New York City is not an endemic center of goiter.

TEXTILES AND CLOTHING

Strength tests at any atmospheric conditions, P. E. Morrill (*Textile World, 70 (1926), No. 24, pp. 43, 44, figs. 3*).—The results of tests made on cotton sheetings and Osnaburgs under varying relative humidity with constant dry bulb temperature, and vice versa, indicated that the tensile strengths of such materials can be computed fairly accurately at standard atmospheric conditions of 70° F. and 65 per cent relative humidity from the strengths observed at other temperatures and relative humidities. Procedure based on the tests is outlined.

Result of light-fastness tests (*Textile World, 70 (1926), No. 24, pp. 115, 116*).—Experiments by the U. S. Bureau of Standards cooperating with the American Association of Textile Chemists and Colorists have revealed that dyeings subjected to continuous vertical exposures facing north, under glass, have faded very differently from similar exposures facing toward the sun (south). Exposures made without glass faded on the average very much like exposures under glass, but with a slight increase in fading in some cases. A good many dyes darkened in light exposures instead of becoming paler, although on prolonged exposure they eventually became lighter. Basic dyes of various chemical classes and indigoid dyes on cotton faded more, relatively to other classes of dyes, on exposure to the northern sky than they did in the sun (southern) exposure. Exposures of the faster dyes have been carried out to 884 hours.

Odors in woolen goods, TEXTUS (*Textile World, 70 (1926), No. 26, pp. 34, 35*).—The causes for odors in woolen goods are described, and methods for detecting and correcting them are outlined.

Fur-dyeing and fur dyes in America, W. E. AUSTIN (*Indus. and Engin. Chem., 18 (1926), No. 12, pp. 1342, 1343*).—A brief discussion of the development and present extent of the fur-dyeing industry in America, and of some of the difficulties in dyeing fur.

Quilts: Their story and how to make them, M. D. WEBSTER (*New York: Doubleday, Page & Co., 1926, pp. XVIII+178, pls. 81, figs. 16*).—A history of patchwork quilts from ancient to modern times, including a chapter on the technique of quilt making. Many photographic illustrations, some in color, of fine examples of quilts of various types, an alphabetical list of quilt names, and a list of literature references are included. The volume is a reprint of an edition published in 1915.

A book of hand-woven coverlets, E. C. HALL (*Boston: Little, Brown & Co., 1925, pp. XIII+279, pls. 64*).—The chief value of this volume, a reprint of one published in 1912, lies in the many photographic illustrations of early American hand-woven coverlets, enabling those inheriting such coverlets to identify them by name.

Clothing: Choice, care, cost, M. S. WOOLMAN (*Philadelphia and London: J. B. Lippincott Co., 1926, 3. ed., rev., pp. XIII+288, pl. 1, figs. 40*).—In the revision of this volume, the first edition of which has been noted previously (E. S. R., 46, p. 95), considerable attention has been paid to the economics of the textile industries as affected by conditions during and following the war and the adjustment of clothing budgets to increased prices. The discussion of this phase of the subject will be found chiefly in the chapters on clothing problems of the day and intelligent shopping, and in five other chapters dealing with the manufacture, value, and uses of the leading textiles and accessories to the wardrobe.

Standard hosiery lengths, E. M. SCHENKE and C. W. SCHOFFSTALL (*U. S. Dept. Com., Bur. Standards Technol. Paper 324 (1926), pp. 667–680, figs. 12*).—Standards are proposed for the length of ladies', men's, children's ribbed, children's sport, infants' ribbed, and infants' and children's socks from measurements on hosiery representing the product of 30 manufacturers.

Methods of investigating ventilation and its effects (*[Gt. Brit.] Med. Research Council, Spec. Rpt. Ser., No. 100 (1926), pp. 71, pls. 2, figs. 21*).—This report, which continues the discussion of the principles of ventilation and use of the kata-thermometer by Hill and Campbell (E. S. R., 55, p. 589), is composed of four parts. Part 1, by H. M. Vernon and J. J. Manley, contains descriptions of two new instruments for the measurement of variations in the velocity and in the temperature of air currents; part 2, by H. M. Vernon, deals with the further calibration of the kata-thermometer; and part 3, by H. M. Vernon and T. Bedford, assisted by C. G. Warner, consists of a comparative study of the objective indications of the kata-thermometer and the actual sensation of comfort.

Part 4, by H. M. Vernon, should be of particular interest to readers of this section in that it deals with the influence of temperature, air velocity, and clothing on the rate of cooling of the human body. In this study the rate of cooling of the human body between 99.3 and 98.3° F. was determined after its temperature had been raised by step climbing. In the unclothed or very lightly clothed body an air current of 100 ft. per minute caused an extra cooling over that with still air, corresponding to a lowering of the air temperature

temperature equilibrium at an air temperature of 81 to 83°, while the warmly clad body would remain in equilibrium at 59 to 60°. It was concluded that to induce cooling of the overheated body of a person engaged in heavy work temperature reduction is of the greatest importance, followed by a reduction in the clothing, and least in importance an increase in air velocity.

MISCELLANEOUS

Thirty-eighth Annual Report [of Arkansas Station], 1926, D. T. Gray (*Arkansas Sta. Bul. 215 (1926), pp. 67, figs. 15*).—This contains the organization list, brief summaries of the chief lines of work of the station, and a financial statement for the fiscal year ended June 30, 1926. The experimental work reported not previously noted is for the most part abstracted elsewhere in this issue.

Annual report of the director for the fiscal year ending June 30, 1926, C. A. McCue et al. (*Delaware Sta. Bul. 147 (1926), pp. 37*).—This contains the organization list, a report of the director including a financial statement for the fiscal year ended June 30, 1926, and departmental reports. The experimental work recorded not previously noted is for the most part abstracted elsewhere in this issue.

A year's progress in solving some farm problems of Illinois: Thirty-ninth Annual Report [of Illinois Station, 1926], compiled and edited by F. J. Keilholz (*Illinois Sta. Rpt. 1926, pp. 184, figs. 31*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1926, and a summary compiled from reports of heads of departments and project leaders on the work during the year. The experimental work reported not previously noted is for the most part abstracted elsewhere in this issue.

Michigan Agricultural Experiment Station Quarterly Bulletin, [November, 1926], edited by R. S. Shaw and E. B. Hill (*Michigan Sta. Quart. Bul., 9 (1926), No. 2, pp. 33–78, figs. 2*).—In addition to articles abstracted elsewhere in this issue, this number contains the following: Machinery and Corn Borer Control, by H. H. Musselman; The Use of Electricity on Farms, by H. J. Gallagher; Sterility in Cattle Serious Problem, by E. T. Hallman; Spraying for Scab Control, by W. C. Dutton; and Profiles of Michigan Soils, by J. O. Veatch.

Publications available for free distribution (*Idaho Sta. Circ. 41 (1926), pp. 4*).—The available station and extension publications are listed.

NOTES

Georgia Station.—J. P. Nichols, jr., of Griffin, has been appointed to membership on the board of directors, effective January 5, succeeding Judge J. J. Flynt of Griffin, who has been actively associated with the board for many years.

Michigan College.—An increased interest in forest plantings is reported. Over 450,000 seedlings have been sent out by the forestry department for spring planting, as compared with 350,000 for the entire previous year. An estimated demand for over 600,000 seedlings is predicted.

Association of Southern Agricultural Workers.—The twenty-eighth annual convention of this association was held at Atlanta, Ga., February 2 to 4, 1927, with delegates from the agricultural colleges and experiment stations of the South and from the U. S. Department of Agriculture and a considerable number of representatives of commercial and transportation organizations interested in agriculture.

The president of the association, A. M. Soule, of Georgia, declared that more than $2,000,000,000 now wasted annually in the South through mismanagement and misdirected energy on southern farms can be saved through cooperation and coordination of the activities of agriculture, commerce, and industry. Waste in American agriculture constitutes in the aggregate an economic loss of staggering proportions. It is one of the primary reasons for the current depression complained of by farmers and is deterrent to prosperity. He asserted that in comparison with the country as a whole, southern farms contain too much so-called cultivated land, they are materially under capitalized, and lack proper equipment of buildings, implements, and livestock. The exploiting tenant is also a detrimental factor, and Doctor Soule claimed that the South lost $1,000,000,000 in 1926 farming operations through dependence on cotton in a one-crop program. He suggessted that corn, cereals, potatoes, and other food crops should be grown in an effort to balance the agricultural program. Realization by industrial and commercial leaders of an as yet unassumed responsibility and duty to the farmers seems to be one of the most feasible solutions to the problem. The farmers are not appealing for charity, but they need and must have a better coordination of effort and procedure, a balancing up of privileges and opportunities.

A program for agricultural development with the idea of bringing about greatly needed improvement in farming conditions, as set forth in resolutions adopted, recommends the abandonment of agriculture on unproductive lands and intensive cultivation of productive lands for special purposes, adequate Federal and State appropriation for extension work, continuation of the Federal crop reporting service, particularly in regard to cotton, and formulation of a permanent merchant marine policy by the Government.

Advocacy of more diversified farming with drastic reduction of cotton acreage formed the basis of the report of the Cotton Production Council. It deplored the fact that the announced acreage reduction of cotton did not offer promise of betterment of conditions in the approaching season. Planting of more food and feed on more acres was urged, as well as the guarding of American cotton against deterioration. Giving detailed suggestions for control of insect pests, the council held that present methods of dusting have proved satisfactory and should be continued.

Different angles of the problems facing the farmers of the South, principally the economic waste involved in present day agricultural operations, were discussed during the sessions, particularly by the sections of agronomy, agricultural engineering, horticulture, agricultural economics and rural sociology, phytopathology, animal husbandry, dairy husbandry, and home economics, the Cotton States Entomologists, the Southern Plant Board, and a conference of extension agronomists. A review of the scope and results of agronomic investigations conducted with cotton since the World War at the southern experiment stations, presented in the agronomy section by H. M. Steece of the Office of Experiment Stations, showed several lines which can be developed further. Continuation of physiological studies on the cotton plant and of experiments on the effects of cultivation, nutrition, and other environmental factors on the technological qualities of cotton fiber seemed warranted. The movement toward fewer and better varieties should not stop. Further inquiries could be directed toward adjustment of the plant's fertilizer needs to the quality or character of the soils, the prevention of losses of fertilizers by leaching, and the microbiological activities in cotton soils. The soils and crops agronomists could unite in the allocation of the best cotton soils to approved types and varieties of cotton with judicious fertilizer usage and correct spacing, and they must provide suitable crops for lands released from cotton production. Cooperating with the agricultural engineer the agronomist might attack the problems of storage of seed cotton, cotton seed, and lint, and undertake research in ginning. Cultural and harvesting methods must be so modified or devised as to economize labor, reduce investment, and cut production costs.

The following officers were elected: President, H. W. Barre, of South Carolina; vice presidents, H. A. Morgan, of Tennessee, and W. Newell, of Florida; secretary, W. E. Hinds, of Louisiana; and additional members of the executive committee, J. R. Ricks, of Mississippi, J. N. Harper, of Georgia, and A. M. Soule.

First International Congress of Soil Science.—Additional information recently made available concerning this congress, which will be held in Washington, D. C., June 13 to 22, indicates that it will be an event of prime importance in the world of science and agriculture. The congress is the gradual growth of the cooperative efforts of soil experts in various parts of the world. Four meetings of a less definitely organized nature have occurred since 1909 in Budapest, Stockholm, Prague, and Rome. These pioneer conferences have led the way to the forthcoming more pretentious congress with its more comprehensive scope and systematically arranged program.

It is announced that about 100 delegates from 25 or more foreign countries will be in attendance. Papers already received indicate that nearly every phase of soil physics, chemistry, microbiology, mapping, fertility, and cultivation is to be discussed. The program also includes an address by President Coolidge on the afternoon of the opening day and on the evening of the second day a reception to the delegates and their wives by Secretaries Kellogg and Jardine and the foreign ambassadors in Washington. Immediately following the 10-day series of sessions, the delegates will leave on a special train for a month's tour across the country to the Pacific coast, returning part of the way through Canada.

Dr. A. G. McCall has been designated executive secretary of the congress and has been assigned space in the Main Building of the U. S. Department of Agriculture.

Association of Land-Grant Colleges and Universities.—The forty-first convention of this association is to be held in Chicago November 15 to 17, 1927.

EXPERIMENT STATION RECORD

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A significant development of the past few months has been the renewal of interest in the promotion of research. This renewal is indicated alike by numerous public utterances from men eminent in a variety of fields and by a number of specific attempts which have been made to facilitate its orderly organization and extension.

The immediate effect of the World War on research was one of stimulation. A host of new problems arose, pressing for immediate solution and for which the inadequacy of routine experience and empirical knowledge became speedily apparent. Under these circumstances there was a widespread turning to the findings of research, and the authoritative and convincing information thereupon made available created a general feeling of confidence and of appreciation. The agricultural production campaign and the food conservation program will be recalled as classic examples of governmental policies which could hardly have been intelligently undertaken or successfully conducted had they not been based on the experimental work of many years. As time went on, scientific men were more and more systematically mobilized for effective service, listened to as never before, and their value to the Nation universally acknowledged.

Unfortunately for the permanent upbuilding of research which these conditions seemed to forecast, much of the prevailing appreciation proved to have been more or less superficial. Because of the relatively brief period of American participation in the war, it was for the most part merely the accumulated findings of long-continued inquiries that were drawn upon with such satisfaction, and the struggle ended before full realization had come that the reservoir would need replenishing. The months following the signing of the armistice were in this regard, as in many others, a period of disillusionment. The emergency past, many of the agencies which had been most active and assiduous in meeting its requirements found themselves stranded in an environment distinctly less favorable than before the war.

Most of the difficulties, both institutional and individual, were financial in nature. With the rising cost of living, the expense of carrying on research had virtually doubled, yet scientific resources

had remained well-nigh stationary. Publicly supported research was confronted by the general demand for retrenchment and a reduction of expenditures, and this attitude, while seldom carried to the point of curtailing the appropriations customarily made to research institutions, none the less commonly operated in much the same way by merely continuing grants which were no longer adequate. Similarly, endowed institutions, including the large foundations and the universities, found themselves with greatly reduced purchasing power and with a more or less unresponsive public to which to make appeal.

This period of reaction and discouragement in turn has proved to be only temporary, and there are not wanting many indications that the trend is again toward more favorable conditions. In agriculture, for example, public funds have been gradually becoming available in increasing measure. Many appropriations, to be sure, have been granted to meet specific emergencies or restricted in their scope to narrow fields of inquiry rather than for the promotion of research which is fundamental and of wide application. At the same time, there have been noteworthy exceptions in a number of States, while the Federal Government by the passage of the Purnell Act in 1925 has provided a most notable endowment of the experiment stations by increasing the Federal contributions to each State to an amount aggregating in 1930 and thereafter $90,000 per year.

In the field of pure science the outlook has been less promising. Hon. Herbert Hoover, Secretary of Commerce, reported in an address at the Philadelphia meetings of the American Association that "some months ago our leading scientists in reviewing the organizations of pure science of the country were discouraged to find that their activities had been actually diminished during the last decade, whereas if these laboratories are to furnish the increasing vital stream of discovery to our Nation, and our normal part to the world, they should have been greatly enlarged. Moreover, they discovered that the pressures of poverty in Europe were taking a worse toll of pure science abroad."

The causes for this retrogression in this country Secretary Hoover considered to be mainly the increased teaching demands upon university and college staffs and the alluring opportunities in industrial laboratories, but he expressed the belief that "these men of pure science are the most precious assets of our country and their diversion to teaching and applied science reduces the productivity which they could and should give to the Nation. It is no fault of their own but it is the fault of the Nation that it does not give to them and to the institutions where they labor a sufficient support."

As remedies for such a situation he advocated "more liberal ap-

of the confinement as to-day of these undertakings for applied science work," more liberal support of pure science research in our State universities and other publicly supported institutions, increased support from business and industry, and more generous assistance from private benevolence. He predicted great material gains from such a course, but declared that it also embodied something beyond monetary returns. "Our Nation must recognize that its future is not merely a question of applying present-day science to the development of our industries, or to reducing the cost of living, or to eradicating disease and multiplying our harvests, or even to increasing the general diffusion of knowledge. We must add to knowledge, both for the intellectual and spiritual satisfaction that comes from widening the range of human understanding and for the direct practical utilization of these fundamental discoveries. If we would command the advance of our material and, to a considerable degree, of our spiritual life, we must maintain this earnest and organized search for truth."

The address of Secretary Hoover attracted much attention and comment, yet it was by no means an isolated appeal. In speaking a few weeks later at Yale University, under the auspices of the American Institute of Chemists, the Secretary of Agriculture contributed another noteworthy presentation of the matter. Secretary Jardine was discussing the indebtedness of modern agriculture to science, and he pointed out instance after instance of specific discoveries of untold value, declaring that "it is no exaggeration to say that through the research accomplishments of recent years the average farmer to-day knows more of the science on which his industry rests and brings it into constant application than the scientist knew 50 years ago."

Yet, as he went on to say, there remains much to be done. "The agricultural field is full of problems, a large proportion of which depend for their solution on the effectiveness with which underlying problems in pure science are dealt." Accordingly, he argued for a further development of the pure sciences. "American science," he maintained, "needs to concern itself more with fundamental research than it has done heretofore. No country in the world has made such progress in applied science, but our record in pure science is not so flattering." He recalled that since 1900, when the Nobel prizes in physics, chemistry, and medicine were inaugurated, but 4 of the 76 awards have gone to the United States. "On the basis of population, the Netherlands, Denmark, Sweden, and Switzerland received one to every million inhabitants, Germany one to every two and one-half million, Austria one to every three million, England one to every

tion despite the fact that we have vastly more students in colleges and universities in proportion to the population than has any other country in the world."

In his opinion this difficulty is twofold: "We are not laying enough emphasis on pure science in proportion to our emphasis on the application of science, and we are not stimulating and training an adequate personnel in scientific research."

On the latter point, that of shortage of personnel, confirmation is given in a report on research in colleges and professional schools, presented at the recent Philadelphia meeting of the American Association. In this report Prof. Maynard M. Metcalf, of Johns Hopkins University, declares emphatically that "more recruits for research are needed. Every man engaged in research finds his studies opening vistas along many most interesting and important paths which he can not himself follow. Each piece of work entered upon opens up dozens of others. 'The harvests truly are plentiful but the laborers are few.' A much larger proportion of our abler college graduates should choose the life of research—a much larger proportion. Some men, of course, have to provide food and clothing for our bodies, and this army of common laborers needs executive leaders. But the problem of better adjustment of human lives to the realities in the midst of which we live demands not only, and not even chiefly, the proper application of truth as already grasped. It demands much more the search for further truth. Man needs more and better, more nourishing, truer food for his mind, and more grace and beauty to clothe his spirit. A much larger proportion of our abler college graduates might well devote their lives to the search for truth and beauty (two aspects of the same thing), to the search for sounder knowledge of the realities in the midst of which we live and to which we must relate ourselves."

Additional testimony to the need of stimulating pure research has appeared in numerous other recent addresses, and a significant feature is the fact that it has emanated in most cases from men actively engaged in the promotion of some branch of applied science. Among these is Dr. L. O. Howard, Chief of the Bureau of Entomology. Speaking before the staff of the Federal Department of Agriculture on the subject Fifty Years of Economic Entomology, Doctor Howard set forth instance after instance of the progress which has been made in combating specific injurious pests, but he emphasized the fact that underlying all progress in applied entomology was the basic work in pure research, and he urged that provision for its upbuilding should be made in keeping with its fundamental importance.

Likewise in a symposium arranged by the American Association at

the Nation, the close relationships of applied science and pure science were pointed out by several of the participants. Among them was Dr. John M. Coulter, of the Boyce Thompson Institute for Plant Research, who, in discussing the progress and service of botany, stated that "there is one fact, however, that we should always emphasize. This progress has not been due to the study of practice, for the study of practice alone is sterile. It has been due to the fundamental research which has advanced our knowledge, and incidentally this knowledge has suggested new practice."

Doctor Coulter proceeded to take up the tendencies in modern botanical research, and mentioned as the first of these the choice of problems that underlie some important practice. "This tendency was stimulated by the Great War, for at that time botany was called upon to solve many important practical problems. This tendency is so strong at present that I do not believe it will ever subside, but it should be understood. There is no evidence that it is tending to diminish research whose whole purpose is exploration of the unknown, but our recent experience has shown us that many important practices suggest fundamental problems of pure research."

A second tendency among botanical workers which he noted was their increasing realization of the fact that botanical problems are very complex and must be attacked from several points of view. "For example, in former days, in plant morphology we described structures, with no knowledge of their functions. Plant physiologists, on the other hand, described functions, with no adequate knowledge of the structures involved. Ecologists often described responses, with no adequate knowledge of either structure or function. This is all changing, and around each bit of investigation there is developing a perspective of other points of view and other methods of attack."

A somewhat similar point of view is revealed in the paper of Dr. C. E. McClung, of the University of Pennsylvania, dealing with the contribution of biology and its applications. Doctor McClung believes that "one outstanding lesson in our progress so far is that the scientific method provides the best means for determining conditions of existence and of providing the means for meeting them. To the final end of such understanding all divisions of science contribute, and it is not well to emphasize the service of one above the others. To-day one makes the chief contributions; to-morrow another. Each supports and contributes to the rest."

This trend toward research in general is characteristic of the renewed interest in the matter, and may be significant of a reaction from a long period of narrow specialization with little regard for

this broader spirit may be mentioned. One of these is the establishment by the Union of American Biological Societies of *Biological Abstracts*, as a medium for assembling current findings in the entire field of biological research, thereby rendering more readily accessible to the botanist, for example, the discoveries of the zoologist or the worker in animal genetics. This is, of course, a very useful service, for while, as its editors state, "the necessity for specialization, probably to an increasing extent, is recognized, on the other hand it is becoming more and more apparent that highly specialized work is more likely to result in sound progress if undertaken with at least reasonable familiarity with contributory fields." The announced intention of this journal is to summarize all biological literature appearing since January 1, 1926, and it is of interest to note that the initial number, which was issued last December, brought together 1,878 abstracts, a rate of over 22,500 per year. The large reliance upon voluntary assistance for the abstracting of this tremendous quantity of material is another significant experiment for a publication of this size and scope, and if found feasible it will be a practical exemplification of the new spirit of cooperative effort of which there are so many indications.

A second manifestation of the growing belief in the conception of research as an entity finds expression in the attempts to train prospective workers in what may be called the general principles of the subject. The course of lectures on the nature and method of research which was offered to the Graduate School of the United States Department of Agriculture in 1924–25 will be recalled as an early attempt to provide formal instruction of this kind. One of the prime objects of that course, it was stated, was "to present certain principles relating to research which apply throughout the field of science, regardless of the particular subject, in history and bibliography as well as in chemistry and agronomy, the essential qualities of research, the motive which inspires it, the attitude of mind which controls it, and the qualifications in the individual which make for success."

The course was well attended, and while admittedly an experiment seemed to demonstrate quite conclusively the practicability of this sort of instruction, although no instances have been reported of its equivalent having been offered subsequently elsewhere. Of late there have appeared, however, a number of books with much the same purpose. Some of these have been intended primarily for workers in sociology or other specialized branches, but at least one has embraced the field as a whole. This book, entitled How to Do Research Work, has been written, it is announced, "primarily to provide the research worker with a method of procedure from the beginning to the end

As an indication of the scope of the book and of the author's treatment of the subject, it may be mentioned that this entire process is divided into 15 steps, of which 9 precede the actual collecting of the data and 5 deal with their subsequent utilization. Over half of the 139 pages which the book contains are devoted to a discussion of such preliminaries as surveying the field, developing a bibliography, formulating or defining the problem, determining the data required, and ascertaining their availability. While the author disclaims any belief that it is possible to "formulate any rigid theory of procedure which shall be correct regardless of actual conditions in practical fields of research," he has striven to "clarify the fundamentals of all reseach methods," hoping that even to those already familiar with reseach procedure the undertakings may offer suggestions for improved methods and new viewpoints. A more detailed summary of the book is presented elsewhere in this issue.

The revival of interest in research is a matter of considerable importance to every scientific worker whatever may be his specialization. While pure research may not directly repel the corn borer or improve orcharding practice or increase the yield of milk or corn, it may ultimately lead to results no less tangible and substantial. The increasing popular realization of these things is in itself encouraging, and it may be that the movement now apparently getting under way will result in further developments of broad potential significance.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Lectures on certain aspects of biochemistry, H. H. DALE, J. C. DRUMMOND, L. J. HENDERSON, and A. V. HILL (*London: Univ. London Press, 1926, pp. VIII+313, pl. 1, figs. 20*).—This volume consists of a series of lectures given at the University of London during the summer term of 1925 as follows:

Lectures by H. H. Dale on The Chemical Control of Certain Bodily Functions, including The Control of the Circulation in the Capillary Blood Vessels, Active Principles of the Pituitary Body, and The Pancreas and Insulin; lectures by J. C. Drummond, on Modern Views on the Mechanisms of Biological Oxidations, Certain Aspects of the Rôle of Phosphates in the Cell, and The Vitamins; three lectures by L. J. Henderson on Blood and Circulation from the Standpoint of Physical Chemistry; and lectures by A. V. Hill on The Physical Environment of the Living Cell and Lactic Acid as the Keystone of Muscular Activity.

Colloid symposium monograph, [IV], edited by H. B. WEISER (*New York: Chem. Catalog Co., 1926, vol. 4, pp. 378, figs. 126*).—This volume contains the 24 papers which were presented at the Fourth National Symposium on Colloid Chemistry held at Cambridge, Mass., June 23–25, 1926. Of particular interest is the opening paper entitled A Survey of the Main Principles of Colloid Science, by J. W. McBain of the University of Bristol, England, the foreign guest of honor at the symposium. The third symposium has been noted previously (E. S. R., 54, p. 802).

Practical agricultural chemistry.—Quantitative analysis, H. WIESSMANN (*Agrikulturchemisches Praktikum. Quantitative Analyse. Berlin: Paul Parey, 1926, pp. IX+329, figs. 95*).—This laboratory manual of quantitative agricultural chemistry requires no preliminary training in quantitative analysis, the general principles of which are discussed briefly in the opening sections on gravimetric and volumetric analysis, with special reference to fertilizers. These are followed by sections on the analysis of crops, manures, feeding stuffs, milk, and soils.

The use of collodion sacks in obtaining clear soil extracts for the determination of the water-soluble constituents, W. H. PIERRE and F. W. PARKER (*Soil Sci., 23 (1927), No. 1, pp. 13–32*).—In this contribution from the Alabama Experiment Station, the advantages and disadvantages of different methods of obtaining clear soil extracts are discussed, and a detailed study is reported of the dialysis method with reference to the best technique for preparing the collodion sacks and the extracts, the time necessary for establishing equilibrium between the solution inside and outside the sacks, and the use of the method in determinations of the H-ion concentration, nitrate nitrogen, phosphorus, and calcium of soil extracts.

In the preparation of the sacks, Loeb's procedure (E. S. R., 54, p. 108) was used, with slight modifications. It was found possible to make 20 sacks in an hour and to use the sacks several times.

The time required for equilibrium was found to depend upon the kind of ion and the kind and amount of shaking. For readily soluble ions such as

hydrogen, chlorine, and nitrate two hours of shaking of the flask in a drawer-type shaker or 18 hours standing with occasional shaking by hand were found to establish complete equilibrium. For more difficultly soluble ions such as phosphate, calcium, and potassium an arbitrary time of 18 hours of standing with hand shaking of the flasks once every hour during the day is recommended.

A comparison of the results obtained in H-ion concentration determinations of soil extracts prepared by the collodion sack method, of filtered soil extracts determined by the colorimetric method, and of soil suspensions determined by the electrometric method showed good agreement.

In the nitrogen determinations a comparison was made between soil extracts prepared by dialysis, modified suction filtering, and flocculation by the Harper method (E. S. R., 51, p. 111). The results showed good agreement except that the flocculation method gave poor checks. The use of flocculations was found to necessitate the making of a nitrate determination on the reagents, while the filtration method was open to the possibility of loss of nitrates through absorption. The collodion sack method eliminated both of these sources of error. Adsorption of color in the extracts by the carbon black "G Elf" was found not to affect the nitrate nitrogen content of the extract.

In the phosphorus and calcium determinations, the collodion sack method and the suction filter method gave extracts of practically the same concentration.

"It is evident from these studies that the collodion sack method is not only adaptable to the securing of extracts for determinations of H-ion concentration, of nitrates, and of water-soluble phosphorus and calcium, bnt also that it should be equally well adapted for use when any of the other water-soluble constituents of the soil are to be determined. Not only does it furnish large amounts of clear extract from which all water-solnbie constituents can be determined by even the most exacting colorimetric methods, but also its use is simple."

The composition of mesquite gum; the isolation of *d*-galactose and *l*-arabinose, E. ANDERSON and L. SANDS (*Jour. Amer. Chem. Soc., 48 (1926), No. 12, pp. 3172–3177*).—Further studies on the composition of mesquite gum (E. S. R., 55, p. 10) are reported. By successive hydrolysis with sulfuric acid in 4 per cent concentration at 80° C. and 3 per cent concentration in the autoclave or boiling water bath, *l*-arabinose was obtained to the extent of 50.7 per cent, *d*-galactose 18.7 per cent, and an aldehyde acid belonging to the glucuronic acid group 13 per cent of the gum. These products, together with the moisture, ash, and a small amount of nitrogenous material, accounted for nearly all of the gum.

Vitamins and other constituents of grape-fruit rind, S. G. WILLIMOTT and F. WOKES (*Biochem. Jour., 20 (1926), No. 6, pp. 1299–1305, figs. 3*).—Data are reported on the composition of the rind of ripe West Indian grapefruit and on the content of vitamins A and B in the flavedo (outer rind) and rind oil.

The flavedo, which constitutes from 4 to 5 per cent of the total weight of the grapefruit, had a moisture content of from 70 to 75 per cent as determined by drying at 40° C. The H-ion concentration of both flavedo and albedo (inner rind) ranged from pH 4.3 to 4.6 and of the juice from pH 5.1 to 5.2. An extract of the fresh flavedo in 90 per cent alcohol gave the following results on analysis: pH 4.4, specific gravity at 15° 0.9497, total solids 5.74 per cent, reducing sugar 2.8 per cent, and total sugar after hydrolysis at 40° 3.6 per cent.

In the vitamin A experiments, which were conducted on only three rats, the Hopkins basal vitamin A-free diet was used, with vitamin D supplied by direct irradiation of the animals. The addition to the basal diet of 0.5 gm.

daily of finely minced fresh flavedo caused a resumption of growth at a slow rate for a short period. When growth had again ceased an equivalent quantity of 90 per cent alcoholic extract was fed, with a slight and temporary resumption of growth. It was concluded that the flavedo contains a small amount of A. The oil extracted from the fresh rind was found to contain only slight traces of A. The flavedo proved to be quite rich in vitamin B when tested by methods used in the previous study of the vitamin B content of lemon rind (E. S. R., 55, p. 593). An amount of 0.5 gm. daily brought about vigorous resumption of growth, but the 90 per cent alcohol extract did not have so pronounced an effect. This was thought to indicate that the alcohol had not completely extracted the vitamin B from the rind.

The flavedo was found to give a strong peroxidase reaction, which may possibly account for its small content of vitamin A.

Antineuritic vitamin [trans. title], B. C. P. JANSEN and W. F. DONATH (*Chem. Weekbl., 23 (1926), No. 16, pp. 201–203; Eng. abs., p. 203*).—In this study of the antineuritic vitamin content of rice bran, with attempts at its isolation, tropical singing birds (*Munia maja*) were used to test the potency of the various preparations as recommended in a previous paper (E. S. R., 44, p. 171).

The bran was extracted in portions of 100 to 250 kg. at an acidity giving a final H-ion concentration of the extract of about pH 4. Attempts at purification by precipitation with mercuric sulfate, phosphotungstic acid, etc., were unsuccessful, but on treatment with acid clay, a form of fuller's earth, about 80 per cent of the vitamin was adsorbed. The active material was set free with barium hydroxide and further purified with norit, which removed some of the impurities but did not precipitate the vitamin. From 3 to 4 gm. of a semicrystalline residue was obtained as the final product from 100 kg. of bran. This substance did not reduce Fehling's solution even after hydrolysis, and contained from 10 to 11.5 per cent of nitrogen. About 0.05 mg. per day was sufficient to protect the birds against polyneuritis for from 15 to 20 days.

Effects of various agents on colour tests for vitamin A, S. G. WILLIMOTT, T. MOORE, and F. WOKES (*Biochem. Jour., 20 (1926), No. 6, pp. 1292–1296, fig. 1*).—On further examination the Fearon pyrogallol test for vitamin A (E. S. R., 55, p. 712), at first thought to be specific for this vitamin (E. S. R., 56, p. 112), has been demonstrated to be unreliable. Cod-liver oil sulfonated by treatment with concentrated sulfuric acid was found to give positive results with the Fearon reagent but negative with all of the other color reagents proposed. Biological tests conducted with the sulfonated oil showed it to be devoid of vitamin A. Similarly, cod-liver oil after treatment with phosphorus pentoxide still gave the Fearon but not the other color tests. Cod-liver oil exposed to irradiation for varying lengths of time gave negative results with arsenic trichloride and antimony trichloride after irradiation for 1½ hours, but positive with the Fearon reagent after over 3½ hours. Arsenic trichloride and antimony trichloride gave parallel results at different stages of the destruction of vitamin A by irradiation. Of the two, the antimony trichloride test is recommended as the more suitable in that the color persists a little longer. In either case it is recommended that the readings be made not more than 30 seconds after mixing. Absolute dryness of the chloroform is considered essential.

A critical study of colour tests suggested for vitamin A, O. ROSENHEIM and T. A. WEBSTER (*Lancet [London], 1926, II, No. 16, pp. 806, 807*).—In this brief report of a comparison of the Rosenheim-Drummond arsenic trichloride (E. S. R., 55, p. 807) or the Carr and Price antimony trichloride test for vitamin A (E. S. R., 56, p. 10) with the Fearon pyrogallol test (E. S. R., 55, p.

712), evidence is presented along chemical and biological lines that the Fearon test is not related to vitamin A.

The unsaponifiable fractions of active oils gave the arsenic trichloride or antimony trichloride test with increased intensity but negative pyrogallol tests. The liver oils of birds and mammals also gave positive tests with antimony trichloride and negative with pyrogallol, while some body fats gave negative tests with antimony trichloride and positive with pyrogallol.

In the biological tests sardine oil was ineffective as a source of vitamin A in growth experiments on rats, although giving a pyrogallol test as pronounced as cod-liver oil. Pig-liver fat gave results with antimony trichloride, and feeding tests showed it to possess a high content of vitamin A but a negative test with the Fearon reagent.

Incidentally attention is called to the possibility of using the peroxide test in connection with other tests when judging the value of cod-liver oil as a source of vitamin A. An old sample of cod-liver oil reacting negatively to the arsenic trichloride and growth tests was found to give a strong peroxide reaction. The authors state in conclusion that it is surprising that the knowledge of the destructive action of both light and air on vitamin A has not led to the more extensive use of small brown glass bottles for the distribution of cod-liver oil.

The nature of Fearon's colour reaction and its non-specificity for vitamin A, O. Rosenheim and T. A. Webster (*Biochem. Jour.*, *20* (*1926*), *No. 6*, *pp. 1342–1345*).—Essentially noted above.

The antirachitic vitamin D of cod-liver oil, S. G. Willimott and F. Wokes (*Pharm. Jour. and Pharm.* [*London*], *4. ser.*, *63* (*1926*), *Nos. 3285*, *pp. 473–476; 3286*, *pp. 495–497*, *figs. 2; 3287*, *pp. 521–524*, *fig. 1*).—This paper consists of a survey and critical discussion of the literature on the fat-soluble vitamins A and D, particularly as regards methods for their determination, with comments from the authors' experience.

In their opinion one of the most satisfactory sources of vitamin A uncontaminated by vitamin D is an acetone-ether extract of dried spinach which is said to contain from 200 to 300 times as much vitamin A as fresh spinach and to be practically devoid of vitamin D. Materials suggested as sources of vitamin D free from A are irradiated cholesterol and the vitamin D concentrate of cod-liver oil prepared by the method described by Zucker (E. S. R., 49, p. 608). The various color tests for vitamin A are criticized on account of the fact that as yet they have been tested chiefly on cod-liver oil (a mixture of vitamins A and D), rather than on pure vitamin preparations, and because of the evanescence of the color. To overcome the latter difficulty, the authors recommend the use of stabilizing agents such as resorcinol. In considering tests for the quantitative determination of vitamin D, the McCollum line test is criticized as requiring considerable time, skill, and pathological experience for its successful application. The method employed by Luce (E. S. R., 52, p. 277) is considered unsatisfactory on account of confusion between the growth-promoting and antirachitic values. "It appears to us that the only sound technique for estimating vitamin D is one based on definite pathological changes which have been proved experimentally to be due to absence of that vitamin only. These specific pathological changes must be ascertained by feeding rats on a diet deficient in vitamin D only, and containing the other three vitamins, A, B, and C." It is emphasized that in such a method *attention should be paid to the Ca:P ratio of the diet, a suggested optimum for which is 1.4 to 1.6.*

The possibility of using for the determination of vitamin D the absorption

discussed at considerable length. A repetition of the work of Zucker and his associates (E. S. R., 49, p. 65) has been undertaken, preliminary results of which are thought to indicate that in rachitic animals the relations between the pH of the feces, the calcium balance, and the condition of the animal in regard to rickets are much more complicated than would appear from Zucker's work.

A bibliography of 94 titles is appended.

A rapid and reliable test for vitamin D, H. JEPHCOTT and A. L. BACHARACH (*Biochem. Jour., 20 (1926), No. 6, pp. 1351–1355, figs. 3*).—The test described was suggested by the observation of Zucker and Matzner (E. S. R., 51, p. 464) that the H-ion concentration of the feces of rats on a rachitic diet is on the alkaline side of neutrality, but is rapidly changed to the acid side on the administration of antirachitic substances or by irradiation. The technique for the test is as follows:

Inbred white rats from 20 to 40 days old and weighing from 40 to 60 gm. are fed ad libitum on the Zucker diet 401 composed of patent flour 85, powdered egg albumin 10, calcium lactate 2.8, ferric citrate 0.2, and sodium chloride 2 per cent, with the addition of from 2 to 3 gm. of fresh spinach daily as a source of vitamins A and B. The cages used have false bottoms consisting of zinc screens of such a mesh as to allow passage of concentrated food but not of feces. The feces are collected daily, weighed, taken up in water to make a 2 per cent suspension, and after thorough shaking poured through loose wads of cotton into hydrogen electrodes of the rocking type for electrometric determinations of the H-ion concentration. The determinations are made every 3 or 4 days until the suspension is definitely alkaline, and then more frequently until two consecutive readings give a value of pH 7.3 or more. The material to be tested for vitamin D is then administered to the rats, and after 2 or 3 days daily determinations are made of the feces until two consecutive readings give a value of pH 6.7 or less. The quantity of antirachitic substance necessary to produce the change is considered an antirachitic unit.

It is stated that since the test was first adopted over 280 groups of 4 animals each have been tested, with the development of pH values above 7 in from 10 to 15 days and maintenance of this level as long as the rachitic diet was being fed. The administration of substances without antirachitic effect did not alter the pH values, but samples of cod-liver oil and irradiated cholesterol known to have definite calcifying properties brought about a prompt reduction in the pH of the feces, as did irradiation.

Although it is admitted that similar effects have been produced by the use of acid substances or by diminishing the calcium-phosphorus ratio of the diet, it is thought that this does not detract from the usefulness of the test for substances of known origin such as cod-liver oil extracts.

Determination of fat in malted milk, E. S. ROSE (*Amer. Jour. Pharm., 98 (1926), No. 11, pp. 595, 596*).—Following the trial of various methods of determining fat in malted milk, the author recommends the following modification of the Werner-Schmid method:

A sample weighing from 0.5 to 1 gm. is emulsified with 5 cc. of hot water in a large test tube and then heated with 10 cc. of concentrated hydrochloric acid in a water bath for 5 minutes. After cooling, the mixture is shaken for 2 minutes with from 25 to 30 cc. of a mixture of U. S. P. benzin 2 parts and washed ether 1 part. To avoid loss of liquid through the escape of vapor during shaking, the tube is fitted with a cork stopper containing a piece of glass tubing about 4 in. long bent at a right angle and attached to a short piece of rubber tubing. During the shaking the rubber tube is closed with the fingers except occasionally when the liquid is allowed to flow back into the test tube by releasing the pressure. After the shaking the rubber tube is removed, the

bent glass tube and stopper are washed with a few cubic centimeters of the extraction mixture, and the extract removed by blowing on a dry filter into a tared flask. The whole process is repeated twice, after which the benzin and ether are removed from the combined extracts by distillation, and the flask is dried to constant weight in an oven at 95 to 100° C.

Cider-making trials for the season 1924–25, O. Grove (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt., 1925, pp. 119–128*).—Washing of all apples to be used in cider making is recommended, and a simple contrivance for continuous washing and conducting the apples to the mill is described. The washing not only removes the dirt and débris, but automatically eliminates badly decayed apples which sink to the bottom of the vat, while the sound apples float.

The advantages and disadvantages of pasteurizing cider and inoculating it with a pure culture of yeast instead of allowing it to ferment naturally are discussed, and a new type of pasteurizing apparatus, consisting of a preheater and pasteurizer proper, is described. In this the cold juice entering and the warm juice leaving the pasteurizer pass through alternating coils, by means of which the pasteurized juice leaves the apparatus cold and the cold juice becomes partly heated before entering the pasteurizer, where very little steam is needed to maintain the required temperature of 70° C. (158° F.).

The principal advantages of pasteurization are considered to be the destruction of harmful organisms and a slowing down of the rate of fermentation after inoculation. Possible disadvantages are changes in the flavor of the juice resulting from the heating and the cost of the treatment. The only difference in flavor is said to be a slight lack of freshness which is difficult to detect. The cost of the process with the particular type of pasteurizer used is estimated to be very low.

Theory and practice in processing, C. O. Ball (*Canner, 64* (*1927*), *No. 5, pp. 27–32, figs. 2*).—An attempt to interpret to the commercial canner the significance and application of the results obtained in studies of the heat resistance of bacteria and the rate of heat penetration in canned foods.

Pickle fermentation, F. W. Tanner (*Canning Age, 7* (*1926*), *Nos. 2, pp. 121–123; 3, pp. 353–356*).—This is a discussion of the processes involved in the curing or fermentation of cucumber pickles under factory conditions, of the chemical changes taking place in normal fermentation and in the deterioration of brine pickles, and of improvements in the usual processes by means of which spoilage may be reduced. The suggestions include the use of desirable bacteria as starters, the proper care of empty tanks and barrels, and the preservation and control of the acidity of the brine.

On the refrigeration and preservation of fish.—The first report [trans. title], Z. Ogura and K. Fujikawa (*Chosen Fishery Expt. Sta. Bul. 1* (*1925*), *pp. 8+3+162, pls. 3, figs. 12; Eng. abs., pp. 8*).—This report of an investigation of the practicability of brine freezing as a method of preserving fish includes a description of the freezing apparatus used and data on the factors affecting the speed of freezing of the fish and the length of time the fish remain frozen during transportation, on the comparative value of brine freezing and cracked ice and ice water preservation as determined by chemical analyses of the fish, on the extent of salt penetration during the freezing process, and on the physical changes taking place in the fish during freezing and thawing.

METEOROLOGY

The dependence of yield of crops in Prussia on precipitation and temperature [trans. title], E. Lass (*Landw. Jahrb., 64* (*1926*), *No. 2, pp. 241–296, figs. 24*).—The relation of yield of wheat, rye, barley, oats, potatoes, clover,

alfalfa, and meadow hay to precipitation and temperature in different parts of Prussia during the 15 years 1899–1913 is dealt with in 3-year periods and with reference to seasonal variations. The studies indicate that under the usual climatic conditions prevailing in Prussia the yield of these crops is more obviously dependent upon precipitation than upon temperature during the growing season as well as preceding it. Incidentally, it was observed that variations in solar radiation did not appear to be of very great importance.

Rainfall interception by plants, J. PHILLIPS (*Nature [London], 118 (1926), No. 2980, pp. 837, 838*).—The work of Marloth, De Forest (E. S. R., 50, p. 315), and Horton (E. S. R., 42, p. 317) on this subject is briefly referred to. The author concludes from his own investigations that there is a decided interception loss due to plant cover, especially with fine rains.

A dew-graph areometer [trans. title], P. I. ANDRIANOV (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 3 (1926), No. 10, pp. 661–663, figs. 3; Eng. abs., p. 663*).—A modification of the dew areometer previously noted (E. S. R., 54, p. 13) is described, and observations with it at the Meteorological Observatory of Moscow are reported. The maximum dew during May to July was recorded one hour after sunrise. This was maintained for one hour, then rapid evaporation took place.

Forecasting spring weather from phenological data, I. D. MARGARY (*Quart. Jour. Roy. Met. Soc. [London], 52 (1926), No. 220, p. 404*).—This is a brief preliminary note on forecasts based on the Marsham phenological observations on seven selected plants during January–May, comparing the forecasts with actual results. It is stated that the forecast for the spring of 1926 merely suggested that it would be "rather mild and early," which proved to be "somewhat of an understatement." The phenological data are stated to point to a cold and late spring in 1927.

Climatological data for the United States by sections, [September–October, 1926] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 13 (1926), Nos. 9, pp. [196], pls. 4, figs. 2; 10, pp. [195], pls. 4, figs. 2*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for September and October, 1926.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and W. H. PARKIN (*Massachusetts Sta. Met. Buls. 455–456 (1926), pp. 4 each*).—The usual summaries are given of observations at Amherst, Mass., during November and December, 1926. The December number gives an annual summary, from which the following data are taken:

Mean pressure 29.981 in.; mean (hourly) temperature 45° F., highest 100° July 22, lowest −10° December 27; total precipitation 40.92 in., snowfall 76 in.; cloudiness 2,274 hours; bright sunshine 2,188 hours (49 per cent); prevailing direction of wind, west; total movement 49,840 miles, maximum daily 441 miles November 16; last frost in spring May 6, first in fall September 24; last snow April 27, first November 9.

SOILS—FERTILIZERS

Review of German literature on soil science and plant physiology in 1925 (*Soil Sci., 22 (1926), No. 3, pp. 213–219*).—A list of 88 abstracts is presented.

Methods of practical application of research on soil physics, A. NOSTITZ (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 4 (1926), No. 1, pp. 38–42, figs. 3*).—In a contribution from the Technical High School of Munich methods for the practical interpretation of the results of physical studies of soils are outlined.

The relation of light to soil moisture phenomena, L. B. LINFORD (*Soil Sci., 22 (1926), No. 3, pp. 233–252, figs. 6*).—Studies conducted at the Utah Experiment Station showed that soils at the moisture content corresponding to the hygroscopic coefficient will continue to absorb large amounts of water when exposed to a saturated atmosphere in a dark constant temperature chamber. The amount that the soil will absorb is in excess of the moisture content at the wilting coefficient. The equilibrium point reached under any but isothermal conditions was found to be a function of the light intensity in the apparatus containing the soil. Laboratory light was sufficiently intense to cause serious differences in temperature between transparent and dark bodies. A theoretical discussion of the problem is also presented.

Some observations upon the effect of the size of the container upon the capillary rise of water through soil columns, H. A. WADSWORTH and A. SMITH (*Soil Sci., 22 (1926), No. 3, pp. 199–211, figs. 2*).—Studies conducted at the California Experiment Station are reported in which evidence was obtained that the extent of capillary rise through soil masses from a free water table is affected by the cross sectional area of the column under consideration. In general large columns showed a greater rise after a given time than did small columns.

The results are taken to indicate that the size of the container is of greatest importance in columns with a cross sectional area of less than 25 sq. in. Intensive soil moisture samples indicate that there is no uniform distribution of moisture throughout the length of the capillary columns.

A point or zone of maximum moisture content was found at an appreciable distance above the water table. Some evidence was obtained that in columns of small cross sectional areas the distance of this zone of maximum moisture content above the water level varies with the size of the colnmn, being greater as the columns become larger. When the cross sectional areas of the columns became greater than about 16 sq. in. further increases in size did not affect the relative position of this zone of maximum moisture content.

Moisture samples taken at various points in the same horizontal plane within the column indicated a fairly uniform and consistent moisture content at all points. No experimental evidence was obtained to support the belief that the upward rise as indicated through the glassed face of a capillary column is not indicative of the rise within the whole soil mass.

Investigations into the resistance of sandy soils to wetting, R. ALBERT and M. KÖHN (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 4 (1926), No. 2, pp. 312–318*).—Studies conducted at the Soil Science Institute of the Eberswalde Forestry High School are briefly reported which indicate that the vegetable humus coverings of the grains of soil play, at least in many cases, a decisive part in the saturability of the soil concerned.

The relation between the electrokinetic behavior and the base exchange capacity of soil colloids, S. MATTSON (*Jour. Amer. Soc. Agron., 18 (1926), No. 6, pp. 458–470, figs. 3*).—Studies conducted by the U. S. D. A. Bureau of Soils showed the existence of a relationship between the electrokinetic behavior, the base exchange capacity, and the composition of soil colloids. The quantities of methylene blue required to neutralize the negative charge of different soil colloids corresponded closely to the total contents of exchangeable bases.

The charge on the soil colloids varied markedly according to the kind of exchangeable base present. When a given colloid was saturated with sodium, the charge was much higher than when saturated with calcium. When the

became isoelectiric. The contents of exchangeable bases and the quantities of methylene blue required to neutralize the negative charge of the various soil colloids paralleled the $\frac{SiO_2}{Al_2O_3+Fe_2O_3}$ ratios.

Base exchange in soil colloids and the availability of exchangeable calcium in different soils, F. W. PARKER and W. W. PATE (*Jour. Amer. Soc. Agron., 18 (1926), No. 6, pp. 470–482*).—Studies conducted at the Alabama Experiment Station are reported, the purpose of which was to determine (1) the exchangeable base content of the colloidal and noncolloidal soil constituents, (2) the relation between the chemical composition of soil colloids and their content of exchangeable base, (3) the influence of the nature of the exchangeable base on soil properties, and (4) the availability of exchangeable calcium in different soils.

It was found that all of the exchangeable base in a soil is in the colloidal material. It was possible to determine the colloid content in this soil by the ratio method, using base exchange data. There was a good correlation between the SiO_2/R_2O_3 ratio of soil colloids and their content of exchangeable base. Colloids having a high ratio were high in exchangeable base.

The nature of the exchangeable base was found to influence the heat of wetting and the absorption of water by the soil. Soils saturated with monovalent bases had a lower heat of wetting and, with the exception of sodium, absorbed less water than soils saturated with divalent bases. The exchangeable calcium in soils having a high H-ion concentration was found to have a low availability while that of calcium in nonacid soils was high.

The effect of the nature of the exchangeable bases upon the retention of anions by soils, C. H. SPURWAY (*Jour. Amer. Soc. Agron., 18 (1926), No. 6, pp. 497–515, figs. 4*).—Studies conducted at the Michigan Experiment Station are reported from which the conclusion is drawn that of the many soil factors influencing the fixation of anions, the kind and quantity of base, the ratio of base to base and of base to acid, and the degree of hydrolysis and ionization of both soil bases and soil acids are of great importance.

The influence of electrolytes on the absorption of hydrogen ions, B. AARNIO (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 4 (1926), No. 1, pp. 31–37, figs. 4*).—Studies are reported which showed that the electrolytes potassium chloride and calcium chloride can not expel H ions from clay. It was observed that the potassium chloride solution causes an increase in the acidity of the soil solution as compared with pure water solutions. This is attributed to the interchange of the potassium ions with aluminum ions and the consequent hydrolysis of the resulting aluminum compounds. It was also found that if the ions absorbed in a soil are to be determined, an acid must be used, because the H ions very strongly displace other ions.

The influence of electrolytes on different types of suspensions of clay, F. WITYN (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 4 (1926), No. 1, pp. 43–82*).—A detailed report of a highly technical study of the influence of electrolytes on different types of clay suspensions is presented.

No conclusions are drawn beyond the fact that the results point to the very great importance of lime in agricultural practice, especially in districts in which the amount of rainfall exceeds the evaporation and from which a certain amount of electrolytes, including calcium, is removed from the upper level of the soil and carried into the lower levels. It was found that when the soil has a high lime content the carbonic acid present possesses almost the same properties as sulfuric acid. Consequently in these cases the carbonic acid set free from the roots of the plants can cause flocculation of the finest soil

particles and improve the physical qualities, provided no other factors have a retarding influence on the development of the plants. If, however, the lime content of the soil is not great then gypsum may become of considerable importance, since in comparatively small concentrations it can cause flocculation of the finest soil particles.

Reciprocal repression by calcic and magnesic additions in surface soil, W. H. MACINTIRE (*Jour. Amer. Soc. Agron., 18 (1926), No. 6, pp. 482–497, figs. 4*).—Studies conducted at the Tennessee Experiment Station are reported from which the conclusion is drawn that solutions of calcium or magnesium bicarbonates will not effect reciprocal interchange as measured by the loss of soluble salts, irrespective of the preponderance of either in soils; nor will potassium be replaced by neutral salts of either calcium or magnesium if an appreciable quantity of the bicarbonate of either is present. The results indicate that the presence of an added excess of either bicarbonate will result in a repression of the hydrolysis of the native content of the other bicarbonate.

The absorption of iron by soils, H. C. DOYNE and C. G. T. MORISON (*Soil Sci., 22 (1926), No. 3, pp. 163–173, figs. 2*).—Studies conducted at the University of Oxford, England, are reported, the purpose of which was to show (1) the extent to which iron is removed from solution by various soils, and (2) the soil constituents which are concerned in the removal.

The absorption of iron by 18 air-dried soils in contact with a ferric chloride solution was determined. Of these soils there were three which showed complete removal of the iron from the solution used, and all these contained considerable quantities of calcium carbonate. The results showed, however, that although calcium carbonate is an appreciable and important factor in the absorption of iron other factors such as the gross amount and activity of clay and ferric oxide and organic matter contents also contribute.

The conclusion is drawn that the absorption of iron by the clay fraction of a soil can be attributed chiefly to the effect of exchangeable bases in producing colloidal ferric hydroxide from the solution of ferric chloride by neutralizing the acid formed by hydrolysis, and that this ferric hydroxide effects a mutual flocculation with the clay. It is considered probable that the ferric hydroxide gel in the sandy loam soils tested absorbs iron in the same manner as does the clay fraction. The results also indicate that organic matter apparently is a factor in the absorption of iron, partly because of the amount of exchangeable bases held.

The iron-absorbing powers of soils showed an increase as the weight of calcium carbonate was increased, so that as soon as any additional ferric hydroxide was formed it was immediately removed by the colloidal material in the soil. On increasing the quantities of added calcium carbonate the soil suspensions became more and more turbid up to the point where all the iron was absorbed, when a very complete and extraordinarily rapid flocculation took place. As the concentrations of iron in the solution diminished, the power of the soil to remove iron apparently decreased.

Soil survey of Lake County, Florida, A. E. TAYLOR ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1923, pp. III+401–439, pls. 4, fig. 1, maps 2*).—This survey, made in cooperation with the Florida Department of Agriculture, deals with the soils of an area of 649,600 acres lying in the Lake Region of central Florida. The county embraces three topographic divisions, namely, the rolling upland in the southern portion; the flatwoods in the extreme southern, southwestern, extreme eastern, and northeastern parts; and the undulating to gently rolling uplands in the remaining sections. The drainage of the flatwoods is poor, and that of the rolling and undulating to gently

The poorly drained soils have dark colored surfaces, comparatively thick organic layers, and gray subsoils, whereas the well drained soils are featured by gray surfaces, comparatively thin organic layers, and yellowish gray, yellow, and brown subsoils. The soils vary in texture from loose sands to clay loams and peat, but types of fine sand texture predominate. Including swamp, water and grass, peaty muck, peat, and shell mounds, 20 soil types of 11 series are mapped, of which the Norfolk and Leon fine sands cover 23.7 and 14.8 per cent of the area, respectively.

A list of the common and scientific names of characteristic plants found in the county and of various soil types on which they are usually found is appended.

Soil survey of Bibb County, Georgia, S. W. PHILLIPS ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+1083–1120, fig. 1, map 1*).—This survey, made in cooperation with the Georgia State College of Agriculture, deals with the soils of an area of 160,000 acres lying in the Piedmont Plateau and the Coastal Plain in central Georgia. The topographic features include rolling to hilly uplands, terraces, and bottoms that are narrow in the Piedmont section. The uplands are well drained with the exception of some sinks in the southern part of the county, while the bottoms are subject to overflow.

The heavy red lands of the northern part and the light sandy soils of the southern part are the two distinct classes of soils in the county. Including meadow, 19 soil types of 15 series are mapped, of which the Norfolk and Wilkes sandy loams, the Congaree silty clay loam, the Cecil clay loam, and the Norfolk sand cover 15.7, 14.2, 13.5, 10.9, and 10.5 per cent of the area, respectively. Chemical analyses of some of the prevailing types are included.

Soil survey of Muscogee County, Georgia, S. W. PHILLIPS and A. T. SWEET (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+1121–1158, fig. 1, map 1*).—This survey, made in cooperation with the Georgia State College of Agriculture, deals with the soils of an area of 142,720 acres lying in western Georgia, which is divided into two distinct parts by the fall line between the Piedmont Plateau and the Coastal Plain. The topography ranges from smooth and gently rolling to steep and broken. The county as a whole is well drained.

The soils of the county are prevailingly light in color, ranging from gray to red. They are dominantly low in organic matter. The Piedmont soils are of residual origin. Including meadow, 23 soil types of 16 series are mapped, of which Norfolk sand, Cecil sandy clay loam, Norfolk and Hoffman sandy loams, and meadow cover 19.5, 11.9, 10.9, 10.1, and 10.1 per cent of the area, respectively. Chemical analyses of some of the prevailing types are included.

Soil Survey of Mercer County, West Virginia, A. W. GOKE (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1923, pp. III+247–269, fig. 1, map 1*).—This survey, made in cooperation with the West Virginia Geological Survey, deals with the soils of an area of 271,360 acres lying in the Appalachian Plateau in southern West Virginia. The topography is rough to gently rolling. The principal drainage system of the county consists of the Bluestone River and its tributaries.

The soils of the uplands are of residual origin, and those occupying the flood plains are alluvial deposits washed from the surrounding uplands. Including rough stony land, 15 soil types of 10 series are mapped, of which Dekalb silt loam, stony loam, and loam cover 44.5, 15.4, and 12.6 per cent of the area, respectively.

Why are serpentine and other magnesian soils infertile? A. GORDON and C. B. LIPMAN (*Soil Sci., 22 (1926), No. 4, pp. 291–302*).—In studies con-

from different localities, it was found that all these soils were deficient in important available ions. The nitrate content was low even where the total nitrogen content was considerable, and most of the soils had a pH value generally of about 8.1. The ratio of magnesium to the total concentration of the soil extract was not necessarily high. A few of the soil extracts were deficient in phosphate and potassium.

The addition of nitrate improved the growth of barley in culture solutions in three of the soils. The lowering of the pH value also improved plant growth where necessary ions had been added. The addition of potassium improved root development, and the addition of phosphate increased plant growth. The addition of magnesia to solutions from one soil had no effect on plant growth.

There was a strong parallelism between the composition of serpentine soils and the vegetation found on them.

Some notes on Nelson soils and their treatment, T. Rigg (*Cawthron Inst., Nelson, N. Z., Dept. Chem. and Agr. Bul. 3, n. ser. (1926), pp. 8*).—Practical information on the fertility treatment of these soils is presented.

The absorption of fertilisers by Ceylon soils, A. W. R. Joachim (*Trop. Agr. [Ceylon], 66 (1926), No. 4–5, pp. 303–308*).—The absorptive power of Ceylon soils was found to vary with the nature, compactive power, porosity, and moisture content of the soil. The loss of added fertilizer was slightly greater in the drainage waters from moist soils than from air-dried soils and was also slightly greater from loosely packed soils than from those more firmly compressed.

The nitrates of sodium and potassium were least absorbed, while soluble superphosphate and the sulfates of potassium and ammonium were most absorbed. Potassium chloride was absorbed to a less extent than potassium sulfate. The amount of fertilizer absorbed by a soil increased with time, but by far the greater part was found to take place during the first two hours.

When the fertilizer was incorporated in the upper 3 in. of a 6-in. layer of soil the losses due to a rainfall of 2 in. during 2 hours were hardly appreciable. When a further rainfall of 1 in. occurred 24 hours later a very small proportion of the fertilizer was drained from the top 6 in. This was most marked in the case of the nitrates. The conclusion is drawn that there is less fertilizer leached from soils under the action of rainfall than is generally supposed.

Soils and fertilizers and the maintenance of soil fertility by the use of manures, green manures, and fertilizers in Ontario, S. Waterman and G. N. Ruhnke (*Ontario Dept. Agr. Bul. 322 (1926), pp. 54, figs. 12*).—This extensive discussion presents a large amount of practical information relating to soil management and the selection, purchase, and use of fertilizers and fertilizer materials.

Influence of manures and microorganisms on H-ion concentration in the soil, E. Aghnides (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 4 (1926), No. 2, pp. 294–306, figs. 3*).—Studies are reported which showed a striking parallelism of variation of the yields of kidney beans and of the pH values of soils under different manurial treatments. The numerical importance of the pH value also measured the bacterial activity of the soil. This was taken to indicate that the yield of a soil depends upon its richness in aerobic microorganisms. An influence of solar heat on the pH value of the soil by the agency of microorganisms was manifested, giving results practically identical with those which were obtained with artificial heating. Soils receiving no nitrogen became most acid.

While badly aerated soils showed a distinctl-

ture of 23° C. (73.4° F.), showed a perceptible decrease of acidity or even became alkaline. The results are taken to indicate that the reaction of the soil is subjected to the action in opposite directions of two forces of micro-organic origin. Under normal conditions the fertility of a soil is directly proportional to its aerobic bacterial activity and inversely proportional to its anaerobic bacterial activity.

A new process for determining pH values is briefly described.

The decomposition of green and organic manures under tropical conditions, A. W. R. JOACHIM (*Trop. Agr. [Ceylon], 66 (1926), No. 4–5, pp. 308–312*).—In both laboratory and field experiments the maximum nitrification of green and stable manures took place in nearly every case in soils under tropical conditions at the end of the sixth week. It was found that the use of any green leafy material, such as wild sunflowers, will give as good results so far as nitrate formation is concerned as many of the leguminous green manures. Little nitrate formation was observed in the case of cattle manure. Rainfall was found to affect the nitrate content of the soils to some extent. As the mean rainfall increased the nitrate content of the soil diminished, and vice versa.

Investigations on the decomposition of peanut cake, castor cake, fish guano, crushed fish, and dried blood showed that the period of maximum nitrification for these organic materials varied from the eighth to the tenth week. Organic manures like castor cake and crushed fish, which contained comparatively low percentages of nitrogen, reached their maximum nitrification at about the eighth week. The maximum percentage of nitrogen nitrified was the highest for castor cake and crushed fish and the lowest for blood meal.

Nitrogen availability of green manures, F. LÖHNIS (*Soil Sci., 22 (1926), No. 4, pp. 253–290, figs. 2*).—Field, greenhouse, and laboratory experiments on the efficiency of green manures, conducted by the U. S. D. A. Bureau of Plant Industry, are reported.

The nitrogen availability of green manures showed wide variations which were dependent upon the quality and quantity of the green substances used and on the character of the manured soils. Small amounts of young materials as a rule gave higher percentage returns than large quantities of old materials, with certain important exceptions. Cowpeas, for instance, proved of greater value with increasing age, while young cowpeas and young yellow lupines showed an exceptionally low nitrogen availability. Frozen cowpeas displayed the highest efficiency.

The average availability of green manure nitrogen was from 50 to 80 per cent if the green substances were added to the soil after they had been grown elsewhere. It is considered an open question whether the effect of green legumes turned under in place is really the result of the green manuring or whether it is due more to the influence of the growing legumes as such.

A general acceleration of the activities of soil organisms took place when green manures were incorporated in a soil not too deficient in humus, with the result that the nitrification of the green manure nitrogen was accompanied by an intensified mineralization of the humus nitrogen. Accordingly more nitrogen may be found in the first crop increases than has become available from the green manures. Occasionally on a rich soil more than 200 per cent of the nitrogen applied was returned within a few years. Nitrification tests made in the laboratory gave much lower figures than vegetation tests with the experimental soil, whereas concordant results were obtained by both methods for a soil of low humus content.

On the origin and nature of soil organic matter or soil "humus," II–IV (*Soil Sci., 22 (1926), Nos. 3, pp. 221–232; 4, pp. 323–333; 5, pp. 395–406, figs. 2*).—Parts II–IV of this series (E. S. R., 56, p. 210) are presented.

II. *Method of determining humus in the soil*, S. A. Waksman.—A method for determining soil humus is outlined.

III. *The nature of the substances contributing to the formation of humus*, S. A. Waksman.—It was found that among the various ingredients of natural organic material, such as straw, the lignins are the most resistant to the action of fungi and bacteria, and that their accumulation in the soil accounts for a large part of the soil humus which is formed as a result of the decomposition of the straw. Since humus is usually considered as that part of the soil organic matter which is extracted by alkalies and precipitated by acids, the lignins added to the soil form one of the constituents of this humus. This is due to the fact that most of the fungi and bacteria which attack the natural organic substances added to the soil are unable to decompose lignins to any considerable extent. The lignins are thus allowed to accumulate in the soil in the absence of organisms which are capable of decomposing them.

IV. *The decomposition of the various ingredients of straw and of alfalfa meal by mixed and pure cultures of microörganisms*, S. A. Waksman and F. G. Tenney.—The removal of ether-soluble fractions from barley straw was found to hasten the decomposition of the straw somewhat, but the treatment was without influence upon the decomposition of alfalfa meal.

The removal of alcohol and water-soluble substances had little influence on the decomposition of the straw materials, but greatly reduced the rapidity of decomposition of alfalfa meal. The removal of the lignins from straw and alfalfa meal hastened the rapidity and increased the amount of decomposition of the residual materials. It was found that lignins are not decomposed in the soil, at least within the experimental period of from 32 to 35 days. If they are decomposed at all, the amount of decomposition is insignificant in comparison with that of the other constituents of natural organic matter. The lignin introduced into the soil was recovered practically quantitatively at the end of the incubation period as soil humus.

Carbon and nitrogen transformations in the decomposition of cellulose by filamentous fungi, H. Heukelekian and S. A. Waksman (*Jour. Biol. Chem., 66 (1925), No. 1, pp. 323–342*).—Studies conducted at the New Jersey Experiment Stations of the carbon and nitrogen transformations in the decomposition of cellulose by two typical soil fungi, a Trichoderma and a Penicillium, are reported.

It was found that cellulose is completely decomposed by these organisms, giving carbon dioxide as the only waste product. No intermediary products are left in the media. A considerable part of the carbon of the cellulose is reassimilated by these organisms and built into protoplasm. It was shown conclusively that the carbon evolved as carbon dioxide and that assimilated by the fungi account for nearly all of the carbon of the cellulose decomposed. The carbon and nitrogen assimilated by the organisms showed a definite relationship to one another. The organisms preferred ammonia to nitrate as a source of nitrogen. This was assimilated and transformed into microbial protoplasm. A direct correlation was thus found between the amount of cellulose decomposed and the amount of nitrogen transformed into an insoluble organic form.

Peat: A contribution towards a bibliography of the American literature through 1925, compiled by A. C. Atwood (*U. S. Dept. Agr., Library, Bibliog. Contrib. 12 (1926), pp. [8]+95*).—This comprehensive bibliography was compiled at the request of the American Peat Society.

New investigations on the utilization of stable manure nitrogen in cultivated soils [trans. title], C. BARTHEL (*Fortschr. Landw., 1 (1926), No. 2, pp. 37–41*).—From studies conducted at Stockholm, the conclusion is drawn that the microbiological action of stable manure in cultivated soils is of an indirect nature. It was found that stable manure acts not so much through the microorganisms which it carries to the soil as through the ammonia nitrogen which is added and acted upon by the microorganisms already existing in the soil. The same result was accomplished by the addition of corresponding amounts of other available nitrogenous compounds.

It is further concluded that the physical action of stable manure, especially in certain soils, should not be underestimated, and that the manure should be carefully handled and composted in order to conserve a maximum amount of ammonia nitrogen.

The value of farmyard manure, C. A. MOOERS (*Tennessee Sta. Circ. 6 (1926), pp. 2*).—Popular information on the subject is given.

Studies on the use of raw rock phosphate as a supplement to rotted manure on the Fargo clay, H. L. WALSTER (*North Dakota Sta. Bul. 198 (1926), pp. 15, figs. 5*).—It is reported that raw rock phosphate applied at the rate of 1 ton per acre every 5 years as a supplement to rotted manure applied every 5 years at the rate of 10 tons per acre gave an average annual increase in the yield of wheat of 2 bu. per acre over that obtained from an application of the same amount of rotted manure. During 10 comparable years raw rock phosphate failed to increase the yield of sweet clover hay or of barley. During 9 comparable years it caused no significant increase in the yield of flaxseed, and during 6 comparable years it failed to increase the yield of ripe corn.

Under continuous culture no evidence was obtained that the addition of raw rock phosphate increased the yields of wheat, oats, or barley. The average corn yields were very slightly increased by the supplemental use of raw rock phosphate, which were, however, not sufficient to cover the costs involved.

How far does superphosphate penetrate soil? T. D. HALL and P. KAMERMAN (*Union So. Africa Dept. Agr. Jour., 12 (1926), No. 5, pp. 406–409*).—Experiments conducted at Potchefstroom are briefly reported, from which the conclusion is drawn that in a brown loam soil there is no danger of loss of superphosphate by leaching below the reach of common crops.

The rôle of phosphorus in agriculture, E. VANSTONE (*Jour. Soc. Chem. Indus., 45 (1926), No. 13, pp. 78T–80T*).—A review of studies by different investigators on the use of phosphoric acid as a fertilizer is briefly presented.

Influence of sulfur and gypsum on the solubility of potassium in soils and on the quantity of this element removed by certain plants, O. M. SHEDD (*Soil Sci., 22 (1926), No. 5, pp. 335–354*).—Studies conducted at the Kentucky Experiment Station are reported which consisted mainly of solubility tests for potassium of 11 Kentucky soils of different types subjected to different treatments. Cropping tests with young wheat and buckwheat plants were also conducted on treated soils for a short time at the end of a 4-month period of digestion.

The results indicated that all soils showed increases in water-soluble potassium with the sulfur treatment, and that five out of seven showed gains even when calcium carbonate was added with sulfur. Only one soil produced more water-soluble potassium when treated with gypsum, although three soils treated with this material gave an increased amount of potassium in the ammonium nitrate digestion. An increased quantity of potassium was found in wheat grown in one soil after the gypsum treatment, and larger amounts of the same element were extracted by water and ammonium nitrate. This is

The results on the other soils generally were not so good with gypsum as with sulfur.

No consistent correlation between the amounts of potassium extracted by the solvent and by the plant appeared except in a few instances. The results are taken to indicate that the plants obtained the potassium for their initial growth from that which was soluble rather than absorbed. Calcium carbonate generally had a beneficial effect on the oxidation of sulfur, but a depressive effect on the soluble potassium extracted by every solvent except 0.2 N nitric acid.

In the majority of treatments without calcium carbonate the amount of potassium soluble in ammonium nitrate solution was larger than the combined amount obtained by distilled water and 0.2 N nitric acid, whereas with this base present it was less. Moreover, with the same solvent and calcium carbonate treatment the potassium obtained was generally less than that extracted from the untreated soil. There was very little variation in the H-ion concentration in the different treatments of the same soil except when calcium carbonate was added.

Agricultural liming materials (*Md. Univ. [Quart.] No. 119 (1926), pp. 16*).—Guaranties and actual analyses of 105 samples of limes and limestones collected in Maryland from November 1, 1925, to November 1, 1926, are presented.

Report on inspection of commercial fertilizers, 1926, E. M. Bailey (*Connecticut State Sta. Bul. 282 (1926), pp. 95+X*).—Guaranties and actual analyses of 789 samples of fertilizers and fertilizer materials collected for inspection in Connecticut during 1926 are presented, together with a statement of the provisions of the State fertilizer law and a list of brands registered in the State during the year. A brief review by E. H. Jenkins on The Effect of Chlorides upon the Burning Quality of Tobacco is appended.

Commercial fertilizers, C. H. Jones, G. F. Anderson, and E. F. Boyce (*Vermont Sta. Bul. 258 (1926), pp. 20*).—Guaranties and actual analyses of about 300 samples of fertilizers and fertilizer materials, representing 146 brands which were collected for inspection in Vermont during 1926 are summarized, and the results are discussed.

1926 "year book" [of] Commercial Fertilizer (*Atlanta: Walter W. Brown Pub. Co., 1926, pp. 147, figs. 2*).—Information relating to the fertilizer industry, with special articles as to individual fertilizer materials, is given.

AGRICULTURAL BOTANY

Textbook of plant physiology, W. Lepeschkin (*Lehrbuch der Pflanzenphysiologie. Berlin: Julius Springer, 1925, pp. VI+297, figs. 141*).—This textbook, presenting plant physiology on a physicochemical basis, is in three parts, dealing, respectively, with metabolism, growth, and movement in plants.

The physiology of growth, C. H. Farr (*Iowa Acad. Sci. Proc., 31 (1924), pp. 175–182*).—A synthetic and somewhat critical review is presented of available facts and views regarding phases of growth in plants.

A note on the relation of rate of growth to structure in plants, L. S. Penrose (*New Phytol., 24 (1925), No. 5, pp. 294–299, figs. 4*).—The author notes, approvingly, statements to the effect that the form of an organism is determined by its rate of growth in various directions, and that the ratio between rates of growth in various directions may sometimes be of a simple kind, as when growth results in the definable outline of a shell or the smooth curve of a leaf. It is the purpose of the present paper to amplify this idea in regard to one or two special cases of plant growth by showing how certain common forms

can be referred to relations between the growth rates of their parts and to the growth rate of the whole plant at different periods. While only the simpler possibilities are here discussed, the assumptions are considered to be in harmony with what other methods of investigation in related spheres have warranted.

Light and growth.—I, The effect of brief light exposure upon etiolated plants, J. H. PRIESTLEY (*New Phytol., 24 (1925), No. 5, pp. 271–283, pls. 4, fig. 1*).—Experiments are described showing that etiolated plants of certain species are very sensitive to daily exposures to light of only a very short duration, marked morphological changes resulting. This fact clears up many apparent contradictions in the literature of etiolation, and eliminates any explanation of the morphological changes produced upon etiolated plants by light which is based upon the effects of photosynthetic products. The light action is supposed to be catalytic and to affect products of metabolism in the shoot, not the living metabolic machinery itself.

The isoelectric point for plant tissue and its importance in absorption and toxicity, W. J. ROBBINS (*Missouri Univ. Studies, 1 (1926), No. 1, pp. 3–60, figs. 13*).—"The influence of hydrogen-ion concentration on the absorption of basic and acid dyes indicates an isoelectric point of pH 6.0–6.4 for potato tuber tissue. . . . Elodea (*Anacharis canadensis gigantea*) responds in many ways as though it has an isoelectric point of pH 6.0–6.2."

The transpiration stream, H. H. DIXON (*London: Univ. London Press, 1924, pp. 80, figs. 2*).—In three lectures delivered before the University of London in January, 1924, the author endeavored to indicate the position of the cohesion theory of sap ascent, with a summary of adverse criticism offered since the publication of the author's work on transpiration and ascent of sap in plants (E. S. R., 33, p. 127). The third of these lectures is claimed to have shown how, by an extension, this theory may, in addition to solving the old problem of the ascent of sap, be made to furnish a clue to the mechanism of the transport and the distribution of the organic substances in plants.

On the solutes exuded by root pressure from vines, J. H. PRIESTLEY and A. WORMALL (*New Phytol., 24 (1925), No. 1, pp. 24–38, fig. 1*).—A distinction is suggested between plants typified by *Vitis* sp., in which the sap pressure is always upward from the root, with only one maximum, and those typified by *Acer* sp., in which the flow is downwards as well as upwards and in which flow and pressure fluctuate more and are more closely related to air temperature. It is suggested that in the Acer type, the result of the development of an exudation pressure by the root in the spring may be the irrigation of the cortex of the shoot by the sap, with a considerable increase of flow and pressure as a consequence of activity in the parenchymatous region of the shoot. It is thought that the chemical nature of the sap exuding from Acer may disagree with that from Vitis. Methods are described by which large quantities of vine sap were collected under sterile conditions, and the chemical results are summarized of the examination of this sap. The presence of several dibasic acids, with practical absence of any other type, is emphasized and discussed. The absence of all but a trace of organic nitrogen is noted. The presence of the enzymes diastase and peroxidase is briefly discussed.

Photosynthesis: The assimilation of carbon by green plants, W. STILES (*London and New York: Longmans, Green & Co., 1925, pp. VII+268, figs. 15*).—The work previously noted (E. S. R., 38, p. 821) presented a critical account of what were at the time recent results of study applied to carbon assimilation by plants. The present volume, though not a revision of the earlier one, is an attempt to present similarly a unified general view of the present state

of knowledge regarding photosynthesis. The bibliography, confined mainly to works cited in this text, contains 870 references, including most works of importance up to the autumn of 1924.

The first sugar of photosynthesis and the rôle of cane sugar in the plant, J. Parkin (*New Phytol., 24 (1925), No. 1, pp. 57–64*).—A somewhat controversial critical review is given, with comments, of the rôle of cane sugar in plants.

The rôle of cane sugar in the plant, R. E. Chapman (*New Phytol., 24 (1925), No. 5, pp. 308, 309*).—A short discussion of the paper by Parkin above noted.

The mechanism of carbohydrate splitting during anaerobic respiration in plant organs [trans. title], J. Stoklasa and J. Bareš (*Sborn. Československ. Akad. Zeměděl. (Ann. Czechoslovak Acad. Agr.), 1 (1926), No. 1, pp. 1–46, figs. 2; Fr. and Ger. abs., pp. 42–44*).—The present article presents results of studies carried out during 25 years on aerobic respiration in plants with references to related literature. The authors have not been able to confirm the view that alcohol is always formed from acetaldehyde. They hold that acetaldehyde may be formed as a secondary product in the process of oxidation of ethyl alcohol. All changes in the plant cell are processes involving reduction or oxidation.

The effect of artificial aeration of the soil on Impatiens balsamina L., C. Hunter and E. M. Rich (*New Phytol., 24 (1925), No. 5, pp. 257–271, figs. 7*).—*I. balsamina* showed the beneficial effects of soil aeration in immediate augmentation of growth rate, transpiration, and respiratory activity. It is suggested that these results are due to removal of carbon dioxide caused by root respiration and soil organism activities. Turgor pressure increase may also be a feature.

Growth of wheat roots in salt solutions containing essential ions, S. F. and H. M. Trelease (*Bot. Gaz., 80 (1925), No. 1, pp. 74–83, figs. 2*).—A study is reported of root growth in young wheat seedlings supplied with solutions containing one or more of the salts potassium dihydrogen phosphate, calcium nitrate, and magnesium sulfate. Thirty-seven different solutions were tested, each having a total concentration of 0.06 gram-molecule per liter. Besides the 3 single-salt solutions, the series included 9 2-salt solutions and 25 3-salt solutions. No marked retardation of root elongation occurred unless the volume-molecular concentration of at least one of the three salts constituted less than about 15 per cent of the total volume-molecular concentration of the solution. The roots were not very sensitive to small differences in salt ratios, except when the partial concentration of calcium nitrate in the solution was below about 5 per cent of the total concentration. Root elongation in very young seedlings is considered as not too complex for experimentation aiming toward reliable results.

Theory of regeneration based on mass action, II, J. Loeb (*Jour. Gen. Physiol., 6 (1923), No. 2, pp. 207–214, figs. 2*).—In Part II of this series (E. S. R., 51, p. 731) the polarity in the regeneration of an isolated piece of stem of *Bryophyllum calycinum* is said to express itself by the characteristic facts, first, that regeneration occurs only at the extreme ends, and, second, that the character of the regenerated organs is different at the opposite ends, shoots being formed at the most apical nodes and roots at the extreme basal end of the piece. Quantitative proof is furnished that all the material available for shoot and root formation in an isolated leaf of *B. calycinum* flows to those notches where, through the influence of gravity or by a more abundant supply of water, growth is accelerated. As soon as acceleration of growth in these

notches commences, the growth of the shoots and roots in the other notches which may already have started ceases.

"It has been shown in a preceding paper that the regeneration of an isolated piece of stem may be, and frequently is in the beginning, not markedly polar, but that after some time the growth of all the roots except those at the base and of all the shoots except those at the apex is suppressed. This analogy with the behavior of regeneration in a leaf in which the growth in one set of notches is accelerated suggests that in an isolated stem a more rapid growth is favored at the extreme ends (probably by a block of the sap flow at the extreme ends), and that when this happens the total flow of ascending sap goes to the most apical buds and the total flow of the descending sap goes to the most basal roots. As soon as this occurs, the growth of the other roots and shoots is suppressed."

Theory of regeneration based on mass relation.—III, Further experiments on the cause of the polar character of regeneration, J. LOEB (*Jour. Gen. Physiol., 6 (1924), No. 4, pp. 463–477, figs. 8*).—The term "mass relation" is adopted as preferable to the term "mass action" used in previous papers (see above).

"Small stems with one large leaf in the middle produce shoots and roots chiefly at the expense of material sent into the stem by the leaf. Since the sap of the leaf can cause the formation of roots and shoots in the same notch of the leaf it is difficult to assume that the polar character of the regeneration in the stem is due to a chemical difference in the ascending and descending sap sent by the leaf into the stem.

"When the ascending sap sent by a leaf into the stem is caused with the aid of gravity to reach those tissues of the stem from which roots are formed, an abundant root formation is produced by the ascending sap.

"These two observations in connection with a fact already published in a preceding paper [referred to above] support the idea that the polar character of regeneration in a stem of Bryophyllum is not due to any of the chemical differences between the ascending and descending sap but to a difference in the nature of the tissues or anlagen which are primarily reached by the ascending and descending sap."

Regeneration from a physico-chemical viewpoint, J. LOEB (*New York and London: McGraw-Hill Book Co., 1924, pp. IX+143, figs. 115*).—The main basis of this short monograph has been furnished by the author's own work, papers reporting phases and results of which are noted above. The contents are arranged in two parts, the first correlating mutilation and regeneration on the basis of the mass relation, and the second attempting a similar treatment of the problem of the polar character of regeneration.

It is said to be the purpose of this volume to show that a simple mass relation can be used as a guide through the various phenomena of regeneration. Equal masses of isolated sister leaves produce, under like conditions of illumination, temperature, etc., approximately equal masses of shoots and roots in equal time. With this relation in view it is claimed to be possible to explain certain puzzling matters for which various explanations have been offered. Theoretical and practical considerations are presented.

Further studies of the germination of woody plants, L. H. PAMMEL and C. M. KING (*Iowa Acad. Sci. Proc., 31 (1924), pp. 157–167, figs. 11*).—This is designated as Contribution No. 7 on the germination of woody plants (E. S. R., 52, p. 516). Trials are made with seeds of about 30 species, which are indicated.

On the anatomy of Orobanche hederae Duby, and its attachment to the host, P. Tate (*New Phytol.*, *24* (1925), *No. 5, pp. 284–293, figs. 3*).—Seeds of *O. hederae* do not germinate in the absence of the host plant. The results of its activity in connection with the host are discussed.

The "spruce budworm" biocoenose, I, II, I. W. Bailey (*Bot. Gaz.*, *80* (*1925*), *Nos. 1, pp. 93–101, pls. 3; 3, pp. 300–310, pls. 3, figs. 3*).—In studying the more or less abnormal growth layers in the stems of conifers defoliated by the spruce bud worm, it is found difficult in many cases to determine which rings were formed during specific growing seasons. This is due to the omission of layers, particularly in the basal portions of the stem, and to the occurrence of structures resembling false rings.

A study of frost rings in various forest areas of eastern Canada, noted in Part I, is said to indicate that the injuries produced by certain frosts are widely distributed in the stems of such trees as fir balsam, alder, hazel, birch, willow, poplar, cherry, and mountain ash, these injuries affording a reliable means of cross correlating homologous growth layers in different trees, and therefore of accurately dating specific growth layers in fir balsams.

In Part II, structural abnormalities in *Abies balsamea*, two methods are outlined of overcoming difficulties noted in this and the preceding paper. It is shown that weakened and dying trees in coniferous forests defoliated by the bud worm are attacked by various insects and fungi, one of the commonest of these secondary parasites being *Pissodes dubius*. The areas of traumatic tissue induced by the feeding of this weevil are of considerable significance in stem analyses.

Pollen morphology as an index to plant relationship.—I, Morphology of pollen, M. A. Pope (*Bot. Gaz.*, *80* (*1925*), *No. 1*, pp. *63–73*, *pl. 1*).—A study is reported of pollen morphology in numerous genera of about 80 families represented in the flora of Colorado, together with a small number of familiar exotic forms. It is found that while, in general, the shapes and sizes of grains in the various genera of a family correspond rather closely, some families show striking differences, which are particularized.

On the longevity of pollen, R. M. Holman and F. Brubaker (*Calif. Univ. Pubs. Bot.*, *13* (*1926*), *No. 10*, pp. *179–204*).—To find a pollen readily obtainable in quantity and capable of maintaining a high germination rate over a long period, the authors tested the pollen longevity of 50 angiosperm species stored at room temperature under varying humidity conditions. The behaviors of these pollens are reported, with comment. The mean dry air longevity was about 23 days, but this period could be tripled by providing favorable storage conditions. The maximum longevity was over 336 days for *Typha latifolia* pollen stored over fused calcium chloride. The relation between germinating power and ability to fertilize, the causes of differences in longevity of different pollens, and the practical application of methods of extending pollen longevity are briefly discussed.

GENETICS

Body and germ cells, J. W. Harms (*Körper und Keimzellen. Berlin: Julius Springer, 1926, vols. 1, pp. X+516, figs. 202; 2, pp. [3]+517–1023, figs. 107*).—The two volumes of this book deal with the relations between the germ cells and the somatic tissue, with special reference to the origin of the somatic tissue from germinal tissue, the production of germ cells by the mature animal, and the physiological influence of the gonads.

A comparative study of the chondriome in animal and plant cells [trans. title], H. Bouygues (*Actes Soc. Linn. Bordeaux*, *76* (*1924*), *pp. 5–166, figs. 35*).—This is a detailed comparative study.

Cytological study of meiosis in anthers of Oenothera muricata, R. E. CLELAND (*Bot. Gaz., 82 (1926), No. 1, pp. 55–70, pls. 2*).—This is a contribution from Goucher College, Baltimore, Md.

Studies in morphogenetics of animal pigmentation, I, II [trans. title], N. A. IL'IN (ILJIN) (*Trudy Lab. Ėksper. Biol. Moskov. Zooparka (Trans. Lab. Expt. Biol. Zoopark Moscow), 1 (1926), No. 1, pp. 96–106, 130–181, figs. 8; Eng. abs., pp. 106, 177–181*).—Two studies in this series are presented.

Morphogenetic analysis of the genetical constitution in albino guinea pigs.—The hereditary constitution of albino guinea pigs is compared with that of the Himalayan albino rabbit with reference to the effect of temperature in the production of pigmented hair on different parts of the body. The darkening of the nose, ears, and toes is more pronounced with age, but the removal of the hair tends to accelerate the darkening.

Investigations of the temperature influence on the Himalayan rabbit's pigmentation.—The so-called "reaction of Schultz" (E. S. R., 53, p. 526), which consists of the darkening of the hair on various parts of the body by means of temperature influences, is discussed. The threshold of irritation for the production of color in this reaction, which is the maximum temperature at which a minimum amount of pigment is produced, has been worked out for the various parts of the body of Himalayan rabbits in the Zoological Park of Moscow as follows: Side, back, and breast 1 to 2° C., nose 29 to 30° C., ears 25 to 27° C., upper eyelid 3° C. and higher, spots under the eyes 2 to 7° C. and higher, fore feet 14° C., hind feet 16° C., and tail 29° C.

The thresholds of irritation for the sides and back were found to be raised in Himalayan rabbits from 5 to 8 days of age and again with advanced age, and were found to differ in Himalayan rabbits of different origin.

Studies of the effect of diseases, irritators, and chemicals indicated that the threshold of irritation is dependent on the temperature of the normal tissue. With a rise in the tissue temperature the threshold falls, and vice versa.

The genetic formula of the individual evidently controls the degree of pigmentation which may be induced. A factor A′, a third allelomorph in the albino series, is considered responsible for the Himalayan pattern by sensitizing the tissue so that it responds to the influence of temperature.

White as a dominant color in Merinos [trans. title], M. M. ZAVADOVSKIĬ (ZAWADOWSKY) (*Trudy Lab. Ėksper. Biol. Moskov, Zooparka (Trans. Lab. Expt. Biol. Zoopark Moscow), 1 (1926), No. 1, pp. 252–255, figs. 3; Fr. abs., p. 255*).—Studies of breeding records of Merino sheep indicated that white is dominant to black and brown.

Ruby eye in animals and its heredity, I, II [trans. title], N. A. IL'IN (ILJIN) (*Trudy Lab. Ėksper. Biol. Moskov. Zooparka (Trans. Lab. Expt. Biol. Zoopark Moscow), 1 (1926), No. 1, pp. 107–129; Eng. abs., pp. 128, 129*).—Two papers in this series are presented.

The ruby eye in the guinea pig.—The characteristics of the ruby-eyed condition as found in the guinea pig are briefly described. The results of experiments have indicated that the gene for ruby eye forms a third allelomorph in the series, with factors for dark eye and pink eye.

The ruby eye in mammals.—The occurrence of the ruby-eyed condition in the guinea pig, mouse, rat, cat, dog, and man is described, and as far as the evidence goes this condition can evidently be combined with most of the known characters.

A second gene producing golden plant color in maize, M. T. JENKINS (*Amer. Nat., 60 (1926), No. 670, pp. 484–488*).—A second factor for golden plant color, golden 2 (g_2), which appeared in Reid Yellow Dent strains in cooperative

studies by the Iowa Experiment Station and the U. S. Department of Agriculture, was found to behave as a simple Mendelian recessive as did the original factor for golden plant color, reported by Emerson (E. S. R., 28, p. 231) and designated as golden 1 (g_1). The factor pairs for golden 1 and golden 2 exhibited a complementary action toward one another, but G_1g_1 and G_2g_2 did not seem to be linked.

Constricted ears of maize, H. J. Sconce (*Jour. Heredity, 17 (1926), No. 7, pp. 257–260, figs. 3*).—The original constricted ear described, found by the author in a field of Johnson County White corn, was normal in size at the butt half while the tip half was constricted, apparently because of incomplete development of kernels on that end. The cob was normal.

Experiments of the author indicated that this constriction is heritable, and that constricted ears are quite susceptible to disease. Only the dwarfed kernels of the original ear showed a tendency to produce a deformed progeny, but during subsequent years all the kernels of the selfed constricted ears, whether normal or dwarfed, produced the constricted ears. The character can evidently be combined with pericarp color.

Nicotiana deformis n. sp. and the enzyme theory of heredity [trans. title], J. A. Honing (*Genetica [The Hague], 5 (1923), No. 5–6, pp. 455–476, pls. 2, figs. 5*).—A further account is given of the stock previously reported as a new species, *N. deformis* (E. S. R., 40, p. 38), and of its divergent behavior when grown in Sumatra or the Netherlands. *N. deformis* suggests, in both foliage and floral anomalies, both the kroepoek and the mosaic disease.

Genetic studies in potatoes.—I, The inheritance of parti-color and suffused tuber color, F. A. Krantz (*Potato Assoc. Amer. Proc., 12 (1925), pp. 32–37*).—Results obtained at the Minnesota Experiment Station on the breeding behavior of three potato varieties could not be explained by the suggestion of Collins (E. S. R., 52, p. 32) that an allelomorphic series of factors is involved in the tuber color, nor was the hypothesis of Kelly (E. S. R., 52, p. 32) applicable. The data were explained by adding a factor *AA* responsible for a suffused tuber color to Salaman's (E. S. R., 24, p. 632) hypothesis in which *D* is a basic factor necessary for the development of pigment and *R* a factor for red color. In the author's experiments *D* and *R*, when both were present, resulted in parti-color tubers. The following genetic constitution for tuber color was indicated: Triumph *DD Rr Aa*, Early Ohio *Dd Rr AA*, and Red McCormick *Dd Rr Aa*.

Fatuoid or false wild forms in Fulghum and other oat varieties, T. R. Stanton, F. A. Coffman, and G. A. Wiebe (*Jour. Heredity, 17 (1926), Nos. 5, pp. 153–165, pl. 1, figs. 2; 6, pp. 212–226, figs. 5*).—An account of aberrant fatuoid forms occurring in *Avena sativa*, varieties Aurora, Culberson, Sixty-Day, Swedish Select, Victory, Navarro (Ferguson Navarro), Ruakura, and Cornellian; *A. byzantina*, varieties Fulghum and Burt; and *A. nuda*, variety Naked (Hull-less), some of which have been studied genetically, is presented, and conclusions from the more important genetic investigations of these forms by others are reviewed.

The occurrence of these forms in cultivated varieties has not been unusual. On the basis of breeding behavior, four distinct genotypes, homozygous-fatuoid, heterozygous-fatuoid, homozygous-cultivated, and heterozygous-cultivated are recognized. While fatuoids occur frequently in Fulghum oats, observations and experiments of the authors suggest that there is little reason to fear their becoming a weed pest.

Apparently genetic variation exists between the aberrant forms found in varieties of *A. byzantina* and those in varieties of *A. sativa*. Fatuoids found in *A. sativa* varieties seem to differ from the cultivated form by a single factor,

while those so far studied in *A. byzantina* may differ by several factors. The data presented led the authors to believe that chromosome irregularity may offer a better explanation for occurrence of fatuoids than mutation or natural crossing. Fatuoids are discussed in relation to the origin of oats species.

Breeding wheat for high protein content, J. A. CLARK (*Jour. Amer. Soc. Agron., 18 (1926), No. 8, pp. 648–661, figs. 5*).—Marquis-Hard Federation crosses grown in Montana under environmental conditions favorable for high protein content and Hard Federation-Propo crosses in California under conditions usually producing wheat low in protein were studied in an attempt to determine the segregation and inheritance of crude protein content in hybrids. See also a previous note (E. S. R., 55, p. 127).

There seemed to be segregation for crude protein content in wheat hybrids similar to that for other quantitative characters, including yield. According to the data, inheritance of crude protein content is as complex as of yield, and environment is quite as important in determining the result in either case. The two characters are often but not always negatively associated. Kernel texture and awnedness of plants are also important factors affecting protein content. Some high crude protein F_3 strains were obtained from plant selections made in the F_2 on the basis of high crude protein content, but such selections were not always superior to others from an F_2 plant of lower protein content. Strains higher in crude protein content than the better parent were not obtained. These studies suggested that the total amount of crude protein per acre, however, may be increased through improvement in yield with maintenance of the crude protein content of the highest parent. To increase the crude protein content of the grain materially it seems necessary to select a high-protein parent, even at a sacrifice in yield.

Contribution to the genetics of wheat [trans. title], K. MEYER (*Jour. Landw., 73 (1925), No. 4, pp. 241–304*).—Studies at the University of Göttingen were concerned with the inheritance of type of spike, awning, pubescence, glume color, and kernel color in four wheat hybrids.

Genetics of breed characteristics, D. C. WARREN (*Poultry Sci., 5 (1926), No. 5, pp. 209–212*).—The behavior of various breed characteristics in crosses between Single-Comb White Leghorns and Jersey Black Giants is described, essentially as in previous reports (E. S. R., 53, p. 427; 54, p. 325).

Crossing between yak (Phoephagus grunniens L.) and zebu (Bos indicus) [trans. title], M. M. ZAVADOVSKIĬ (ZAWADOWSKY) (*Trudy Lab. Éksper. Biol. Moskov. Zooparka (Trans. Lab. Expt. Biol. Zoopark Moscow), 1 (1926), No. 1, pp. 245–251, figs. 6; Eng. abs., pp. 250, 251*).—Brief results are given of the offspring produced by crossing a zebu bull with a yak cow in the Zoological Park at Moscow. Seven progeny were produced as the result of back-crossing the zebu bull to his cross-bred daughter. It is pointed out that the offspring are fertile, at least as far as females are concerned. The inheritance is alternative, and segregation is clearly observed in the pigmentation of the hair, the length of the hair, and the hump.

The dependence of male characteristics on gonads in Lebistes reticulatus, I, II [trans. title], L. ÎA. BLÎAKHER (L. J. BLACHER) (*Trudy Lab. Éksper. Biol. Moskov. Zooparka (Trans. Lab. Expt. Biol. Zoopark Moscow), 1 (1926), No. 1, pp. 81–95, pls. 2, figs. 9; Ger. abs., pp. 89–95*).—The results of two studies are presented, preliminary accounts of which were noted (E. S. R., 56, p. 180).

The disappearance of male coloring correlated with an atrophy of the gonads.—Three additional fish have been added to this series, and histological examinations of the testicles have confirmed the atrophy of the germinal portion of the testicle with a marked development of the interstitial fibrous tissue.

A case of hermaphroditism in Lebistes.—A study of this case which has been described indicates that the male hormone in fish is predominant over the female hormone. From this it is further suggested that the sex hormone of the heterozygous sex is dominant over the hormone of the homozygous sex.

Cryptorchid testes and testicular hormone production, R. M. Oslund (*Amer. Jour. Physiol.*, *77 (1926), No. 1, pp. 76–82, figs. 2*).—Histological studies of natural cryptorchid testicles of man, dog, pig, and sheep at the University of Illinois showed that the seminiferous tubules contain cells which are actively growing and dividing. Not all of these cells were alike, and some resembled embryological spermatogonia. They form spermatogonia after the testicle is replaced in the abdominal cavity.

In discussing the production of hormones in the testes it is stated that the sex hormone is produced by the cryptorchid notwithstanding the absence of mature spermatogonia, spermatocytes, spermatids, and spermatozoa in the tubules. Whether hormone production is a product of the germinal epithelium or the interstitial cells could not be determined.

A study of the effects of testicular extract upon the pregnant guinea-pig and the fetus, F. E. Emery (*Amer. Micros. Soc. Trans.*, *45 (1926), No. 1, pp. 44–53, figs. 6*).—Weekly intraperitoneal injections into virgin and pregnant female guinea pigs at the Kansas Experiment Station with 5 cc. doses of testicular extract, prepared by mixing 1 gm. of desiccated pig testes with 10 cc. of salt solution, were found to produce local pain, watering of the eyes, occasionally coma, and frequently chronic peritonitis, with an emaciated condition accompanying long injection periods. Abortions were numerous in pregnant animals, as 25 per cent of the pregnancies terminated in abortion.

A histological examination of the gonads of the injected animals showed marked degenerative changes with atrophy of the Graafian follicles and cyst formation. The injections caused sterility in young females for as long a period as they were continued. The young born to injected pregnant females were normal, there being 39 females and 38 males among the offspring. The gonads of the males were normal, but the ovaries of the female young were somewhat shrunken with an overabundance of atresic follicles. Ovarian degeneration was not marked, and the formation of cysts was rare in control animals injected with ovarian extract or amniotic fluid.

Ligation of vasa efferentia in rats, R. M. Oslund (*Amer. Jour. Physiol.*, *77 (1926), No. 1, pp. 83–90, figs. 2*).—In studies at the University of Illinois, ligation of the vasa efferentia in rats caused an enlargement and hardening of the testes, due to the retention of spermatogenetic products. Within seven days the size and hardness decreased, due to the cessation of spermatogenesis, degeneration of the germinal epithelium, and absorption of the necrotic material. No signs of recovery were observed, even up to two months after ligation.

FIELD CROPS

The principles and practice of yield trials, F. L. Engledow and G. U. Yule (*Empire Cotton Growing Rev.*, *3 (1926), Nos. 2, pp. 112–146; 3, pp. 235–267, figs. 3*).—Section 1 of this elementary exposition of the difficulties and principles involved in yield comparisons of crop varieties develops the general statistical principles. Section 2 deals with the agricultural significance of yield trial results, yield trial conditions and field conditions, observation plats and observations, the chessboard yield trial, the half-drill strip method described by Beaven (E. S. R., 48, p. 338), size and arrangement of plats, and corrections for soil inequalitis

Some determinations of plat variability, C. K. McClelland (*Jour. Amer. Soc. Agron., 18 (1926), No. 9, pp. 819–823*).—The yields of rows and half rows of corn and of $\frac{1}{40}$-acre plats of oats at the Arkansas Experiment Station are tabulated to show the variability of land for experimental uses. In a study of the effect of size and shape of plat and distribution of corn rows (132 ft. long by 44 in. apart) on experimental error the results showed a gradual reduction of error with increase in size of plat and also a slightly lower error for long narrow plats than for short wide plats of equal area. Reduction of nearly 30 per cent was shown in going from $\frac{1}{30}$ to ½ acre. By distributing the rows the error for $\frac{1}{30}$ acre was reduced from 8.6 to 3.55 per cent and for $\frac{1}{10}$ acre was reduced from 8.3 to about 2 per cent, showing a great advantage in such distribution.

The northern limits of agriculture [trans. title], ÎÛ. D. Tsinzerling (G. D. Zinserling) (*Trudy Prikl. Bot. i. Selek.* (*Bul. Appl. Bot. and Plant Breeding*), *15 (1925), No. 3, pp. 1–146, pls. 6, fig. 1; Eng. abs., pp. 127–142*).—This treatise discusses the factors determining the limits of northern agriculture, indicates the general and specific limits of field crop culture in Asia, Europe, Iceland, Greenland, and North America, and points out the prospects of agriculture at its northern limits. The discussion as summarized in English (pp. 127–142) is agronomic rather than economic.

The varietal diversity of the field crops in the Ukraine [trans. title], N. N. Kuleshov (*Trudy Prikl. Bot. i. Selek.* (*Bul. Appl. Bot. and Plant-Breeding*), *16 (1926), No. 4, pp. 3–89, figs. 4; Eng. abs., pp. 85–89*).—The nomenclature of varieties of spring and winter wheat and of oats and their classification and geographical distribution are dealt with on the basis of district reports and analysis of samples from different parts of the Ukraine.

Report of the division of forage plants, [1923, 1924, and 1925], G. P. McRostie (*Canada Expt. Farms, Div. Forage Plants Rpts. 1923, pp. 45, figs. 9; 1924–1925, pp. 41, figs. 3*).—Investigations (E. S. R., 50, p. 432) reported on for the years indicated include varietal trials with corn and corn hybrids, broomcorn, soy beans, mangels, swedes, fall turnips, field carrots, sugar beets, alfalfa, red clover, white clover, sweet clover, sunflowers, fleshy annual pasture crops (rape, cabbage, and kale), and annual hay crops; comparisons of grass-clover mixtures; breeding work with root crops, sunflowers, grasses, clovers, and alfalfa; and classification studies with mangel varieties according to root type and with corn varieties.

The influence of time of cutting on the quality of crops, A. C. Arny (*Jour. Amer. Soc. Agron., 18 (1926), No. 8, pp. 684–703*).—Review of harvesting experiments indicated that the optimum time or period for cutting grain and forage crops depends on yield, quality, weather conditions at harvest, conveniences in relation to other work, and the maintenance of satisfactory stands of perennial crops. Climatic and soil variations influence results in different locations.

Harvesting crops grown primarily for grain or seed before approximate full maturity does not improve the quality of the product, although under cool humid conditions these crops may be harvested a week or more before maturity and under warm, dry conditions three to four days early without appreciable loss in yield or quality. Where cereal straw is to be fed, harvesting before maturity helps to prevent leaching of nutrients therefrom. The composition, digestibility, and palatability of forage crops can be directly controlled by cutting at the maturity stage, giving results desired. Annual grass crops should apparently develop the kernels to the soft dough stage to obtain the best balance between yield and quality of hay. It appears

desirable to cut soy beans for hay somewhere between the stages "seeds well formed" and "beans half grown." Ordinarily cutting alfalfa somewhere between tenth- and half-bloom as a regular practice seems to result in the best balance between yield and quality and also to maintain a vigorous stand. Leaving a growth from 6 to 8 in. high in the fall to hold winter snows appears important in maintaining alfalfa stands under severe winter conditions.

Injury from burning off old grass on established bluegrass pastures, L. F. GRABER (*Jour. Amer. Soc. Agron., 18 (1926), No. 9, pp. 815–819, figs. 2*).—Blue grass pasture at the Wisconsin Experiment Station burned March 9, 1925 (soil surface completely frozen) and May 11, 1925 (soil completely thawed) yielded 52.4 and 71.3 per cent, respectively, less dry old grass per acre April 21, 1926, than unburned plats and 34 and 34.3 per cent less weight of rhizomes and roots to a depth of 7 in. The burned areas, especially the earlier, became weed infested. So far as the amount of growth is concerned, burning has a very injurious effect upon blue grass pastures.

[**Registration of cereal varieties**] (*Jour. Amer. Soc. Agron., 18 (1926), No. 10, pp. 920–948*).—These pages embrace the following reports of subcommittees of the American Society of Agronomy: Registration of Standard Wheat Varieties, by J. A. Clark, H. H. Love, and E. F. Gaines; Registration of Improved Wheat Varieties, by J. A. Clark, H. H. Love, and J. H. Parker; Registration of Varieties and Strains of Oats, by T. R. Stanton, F. Griffee, and W. C. Etheridge; and Registration of Barley Varieties, by H. V. Harlan, E. F. Gaines, and R. G. Wiggans.

[**Root crops experiments in Canada**], F. T. SHUTT (*Canada Expt. Farms, Div. Chem. Rpt. 1925, pp. 46–51*).—Further analytical data on sugar beets, mangels, turnips, and carrots supplement those noted earlier (E. S. R., 53, p. 135).

Canadian-grown seed has produced sugar beets fully equal in sugar content and purity to those from imported seed of the most approved European varieties. Satisfactory evidence of the possibility of growing in many widely distant districts of the Dominion beets of excellent quality and eminently suitable for sugar production seems to have been presented.

Effect of color of seed, of scarification, and of dry heat on the germination of alfalfa seed and of some of its impurities, G. STEWART (*Jour. Amer. Soc. Agron., 18 (1926), No. 9, pp. 743–760*).—The effect of color on the agricultural value of alfalfa seed has been described in another contribution from the Utah Experiment Station (E. S. R., 55, p. 735). Scarified seed gave a higher percentage germination than unscarified seed in the proportion of 132 : 100, but weak seedlings and moldy sprouts were more frequent in the scarified seed. Dry heat up to 85° C. (185° F.) applied for no longer than 4 hours increased the germination of alfalfa seed by causing most of the hard seed to germinate. Discolored alfalfa seeds were injured considerably at much lower temperatures than were bright, mature seed.

Staker's results (E. S. R., 53, p. 135) were confirmed in that dodder, Russian thistle, and Atriplex tumbleweed were practically eliminated by heating to 85° for 4 hours. The germination of green foxtail (*Setaria viridis*), redroot pigweed (*Amaranthus retroflexus*), and hare's ear mustard (*Conringia orientalis*) was not affected much by heating to 90°.

The castor bean in central Asia [trans. title], G. M. POPOVA (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant-Breeding), 16 (1926), No. 4, pp. 145–240, pl. 1, figs. 12; Eng. abs., pp. 227–240*).—From investigations on *Ricinus* spp. over a wide range of material, the author gives a detailed account of the origin, classification, and specific characters of the castor bean, traces the development of the plant and shows its response to temperature, and describes its

distribution and cultivation practices in central Asia. The English summary (pp. 227–240) shows that considerable attention was paid to the characteristics and distribution of *R. persicus*, breeding work, and the oil contents of different sorts.

Experiments with corn on dry land at the Huntley Branch Station, A. E. Seamans (*Montana Sta. Bul. 194* (*1926*), *pp. 43, figs. 20*).—Investigations with corn, made cooperatively with the U. S. Department of Agriculture (E. S. R., 56, p. 133) during the period 1913–1924, comprised continuous cropping v. rotation, tillage experiments, varietal trials, and hogging down tests. Data were also recorded on precipitation, evaporation, temperature, and wind velocity.

Corn yields were practically equal on spring and on fall plowing. Fall subsoiling to a depth of 14 in. did not increase the yields of grain and stover over those on ordinary fall plowing enough to justify the extra labor. Spring-listed corn has averaged higher in grain yield than corn on spring-plowed or surface-planted land, whereas stover yields were about equal. More grain and stover were produced by corn on summer-fallowed land than with any other method tested, but the advantage over spring listing was not enough to warrant the practice. Where corn followed small grains or flax in rotations, yields after spring wheat were somewhat heavier than after other crops. Manure depressed corn yields in some cases, while in others slight increases were recorded.

Disked corn land was preferred to plowed corn land for small grains and flax. On disked land small grains and flax averaged about midway between yields from continuous cropping and from alternate cropping and summer fallowing, although barley on disked corn land produced better than on summer fallow. The average yield of shelled corn (pounds per acre) was only slightly less than the average oats yield and exceeded that of any other cereal except winter wheat. Rotations including corn produced more total grain and a higher average acre yield of grain than rotations without corn. Northwestern Dent, Payne White Dent, Minnesota No. 23, Falconer, and Dakota White Flint could be depended upon to mature corn before frost practically every year. Several other sorts seemed desirable for silage, although not entirely dependable for grain production.

Experiments since 1915 indicate that hogging down corn is an economical means of harvesting. One acre of Northwestern Dent, yielding 16.8 bu., has supported 6.5 hogs (about 90 lbs. initial weight) for 23 days, with an average daily gain of 1.31 lbs. per animal.

Soil moisture determinations in connection with these experiments showed that in general each crop exhausted before harvest every year the soil moisture available to it, regardless of the moisture content of the soil in the spring. The average percentage of spring soil moisture varied somewhat for the crops and cultural methods used. Corn left more moisture in the soil after the removal of the crop than did wheat, oats, or flax. Wheat and oats were about equally efficient, and reduced the soil moisture content to the lowest percentage of any of the crops sampled. The average depletion by flax was about midway between that of small grains and corn.

Growing corn on irrigated land, D. Hansen (*Montana Sta. Bul. 193* (*1926*), *pp. 16, figs. 2*).—Production methods for corn on irrigated land are set forth on the basis of experimental results at the Huntley Substation (E. S. R., 55, p. 132; 56, p. 133) and observations elsewhere in the Yellowstone Valley. The choice of varieties for grain and silage, seed selection and preservation, cultural practices, and ways of harvesting and using the crop are discussed briefly.

Varietal trials showed that under conditions at Huntley best results are had with the semident and early dent corns such as Northwestern Dent and Payne

White Dent, these sorts being most desirable for both grain and silage. The types of corn that can be raised in Montana are best used for silage, forage or bundle feeding, or for harvesting with hogs and sheep. In crop rotation experiments corn thrived and gave uniformly high yields after alfalfa. Grains on disked corn land yielded nearly equal to grains after beets or potatoes.

With corn yields at about 60 bu. per acre the average returns over a 10-year period in hogging down experiments were at the rate of 720 lbs. of pork per acre on corn alone and 783 lbs. on corn and rape. In 1925 on a 3-acre cornfield yielding about 40 bu. per acre hogging down produced pork at the rate of 481 lbs. per acre.

Corn: Relation of protein content to specific gravity, F. T. SHUTT (*Canada Expt. Farms, Div. Chem. Rpt. 1925, pp. 34, 35*).—Specific gravity of kernels of corn did not appear to be directly related to their protein content, although within a strain and its progeny there was a distinct trend towards high gravity being associated with high protein. It appeared that specific gravity can not be relied on for the selection of kernels as to protein content, high or low, and that the protein content of the parent has not determined that of the progeny.

An improved method of delinting cotton seed with sulphuric acid, C. D. SHERBAKOFF (*Tennessee Sta. Circ. 3 (1926), pp. 2*).—The author found that cotton seed could be delinted by the application of 1 part by volume of concentrated commercial sulfuric acid to 17 of seed, saving about 60 per cent of acid as compared with the original method. Delinting can also be accomplished with acid diluted 1 part to 5 of water for 60 parts by volume of cotton seed, seed being delinted in about 5 days. Procedure is outlined.

Fertilizer experiments with cotton, C. B. WILLIAMS, S. K. JACKSON, and H. B. MANN (*North Carolina Sta. Bul. 250 (1926), pp. 18*).—Fertilizer experiments with cotton carried on in North Carolina on Cecil sandy loam in the Piedmont and on Norfolk fine sandy loam in the Coastal Plain dealt with the effects of different proportions of nutrients on yield and maturity and rates of application. Sources of nitrogen were compared on these soils and on Cecil clay loam.

As measured by the average percentage of total crop open at first picking, increases in the phosphorus in the formula made for earliness, in nitrogen caused little or no change, and in potassium caused reduction in earliness on both soils. In most of the field experiments applications of commercial fertilizer increased the percentage of cotton open at the first picking as compared with unfertilized cotton. Fertilized or not, more cotton was open at the first picking on sandy or sandy loam soils in the Coastal Plain than on clay or clay loam soils in the Piedmont. Increasing the quantity of fertilizer per acre had a rather marked effect upon maturity. About 300 lbs. (7–3–2.5) per acre had the maximum effect on Cecil sandy loam, with a decrease after 900 lbs. per acre.

Fertilizer formulas are indicated for certain soil types of the Coastal Plain and Piedmont sections. For average soil types in the Coastal Plain a safe analysis is about 8–5–3 used at the rates of from 600 to 800 lbs. per acre. The percentage of nitrogen at planting should be reduced to about half if as much as 100 to 150 lbs. of sodium nitrate or ammonium sulfate is used as a side dressing after chopping. A 10–4–2 formula at similar rates seems to be the best general fertilizer for the more important soils of the Piedmont. The most economical applications of 7–3–2.5 formula were 800 lbs. per acre on the Coastal Plain and 200 lbs. in the Piedmont, although the greatest net returns in both cases were from 1,000 lbs. Data cited show that fertilizer mixtures

suited to particular soils will often produce increases over the same amount of an unadapted fertilizer sufficient to pay for the entire application of the better suited mixtures.

Trials of nitrogen carriers showed that, as compared with sodium nitrate, dried blood and cottonseed meal each possessed less relative efficiency when used on Norfolk sandy loam in the Coastal Plain than when used on the Cecil sandy and clay loams in the Piedmont, and they averaged only about four-fifths as effective as sodium nitrate and ammonium sulfate. The efficiency of ammonium sulfate ranged from four-fifths to nine-tenths of that of sodium nitrate.

In a study of the value of inorganic and organic nitrogen applied to cotton on Piedmont soils by different methods with normal amounts of phosphoric acid and potash, sodium nitrate divided into two equal applications gave larger increased yields of seed cotton than did blood as the nitrogen source, either when the blood was all applied with the phosphoric acid and potash carriers at planting or when half went in at planting and the other half as a side dressing just after chopping. With the Coastal Plain soil, decidedly best returns were had from applying half the nitrogen in the form of blood with all the phosphoric acid and potash at planting and applying the other half as sodium nitrate.

Annotated bibliography on the storage of cottonseed and of seed cotton, H. M. Steece (*U. S. Dept. Agr., Ext. Serv., Off. Coop. Ext. Work, 1926, pp. 13*).—This mimeographed bibliography presents in summary form the results of official and other investigations concerned with the storage of cottonseed and seed cotton, and calls attention to bulletins and articles giving general information on the problem.

Fulghum oat the best variety for spring seeding, C. A. Mooers (*Tennessee Sta. Circ. 4 (1926), p. 1, fig. 1*).—Fulghum oats is indicated as superior for spring seeding in Tennessee. It outyielded Burt by about 33 per cent at the station and surpassed Burt at Columbia.

Certified Irish potato seed, J. A. McClintock (*Tennessee Sta. Circ. 7 (1927), pp. 2*).—Certified potato seed averaged 183 bu. per acre during 3 years compared to 102 bu. from uncertified commercial stock. Plants from uncertified seed showed 25 per cent of degeneration diseases, while those from certified seed had less than 2 per cent.

Influence of early and late planting and sprouting on the yield and dry matter content of potatoes, F. T. Shutt (*Canada Expt. Farms, Div. Chem. Rpt. 1925, pp. 42–44*).—Results in the fifth year of this inquiry (E. S. R., 53, p. 137) did not seem to warrant definite conclusions.

Fertilizer formulae for potatoes, F. T. Shutt (*Canada Expt. Farms, Div. Chem. Rpt. 1925, pp. 11, 12*).—In experiments during several years in the Maritime Provinces, formulas involving sodium nitrate and ammonium sulfate in equivalent amounts for nitrogen, superphosphate for phosphoric acid, and potassium chloride for potash were applied at acre rates of 1,000, 1,500, and 2,000 lbs. to potatoes in a 3-year rotation of potatoes, grain, and hay.

Practically all of the 30 treatments used gave profitable returns. The data indicated that good returns may be expected from such mixtures as 3 : 8 : 6, 3 : 6 : 6, 4 : 8 : 6, 4 : 8 : 8, or 4 : 8 : 10, depending on the character and fertility of the soil. An acre dressing of 1,200 to 1,500 lbs. of any of the formulas mentioned would probably suffice under average conditions of soil and season for a maximum yield.

Studies on inoculated soybeans.—I, The importance of determining the number and size of soybean nodules for evaluating relative efficiencies of

two or more cultures, L. W. ERDMAN (*Jour. Amer. Soc. Agron., 18 (1926), No. 9, pp. 799–804*).—Nodules collected from Manchu, Dunfield, Peking, and Midwest soy beans at the Iowa Experiment Station were grouped as small, medium, and large; were washed, dried, counted, and weighed, and then were pulverized and analyzed for total nitrogen. The relation between the average amount of nitrogen in each nodule for the three groups for all four varieties was very similar to the average weights of the small, medium, and large nodules. A suggested classification of inoculated soy bean plants is presented for differentiating degrees or intensities of nodulation. The relative efficiency of two or more cultures for the inoculation of soy beans apparently can be accurately determined only after the number and different sizes of nodules have been ascertained.

A study of the sugar-beet position, A. BRIDGES and R. N. DIXEY (*Jour. Roy. Agr. Soc. England, 86 (1925), pp. 59–89*).—The history and development of the sugar beet industry in the United States and elsewhere are outlined, with discussion of its probable expansion in England and Wales and of some factors affecting its future development.

Determinative key to the principal sugar cane varieties in Java in 1925 [trans. title], C. A. BACKER (*Arch. Suikerindus. Nederland. Indië, Meded. Proefsta. Java-Suikerindus., 1926, No. 17, pp. 471–512, figs. 29*).—Sugar cane varieties most widely grown in Java in 1925 are described and listed, and typical buds are illustrated.

Growing sweet clover, G. F. H. BUCKLEY (*Alberta Univ., Col. Agr. Bul. 2, rev. (1926), pp. 26, figs. 6*).—A revision of a publication noted (E. S. R., 52, p. 736).

Effect of chlorine in tobacco, F. B. CARPENTER and A. H. ALLEN (*Amer. Fert., 65 (1926), No. 7, pp. 21–24*).—Popular brands of cigars were found to contain higher percentages of chlorine than generally supposed, especially in the better grades, whereas the average chlorine content of pipe tobaccos examined was much lower than for the cigars or for cigarettes. Where the chloride was a source of potash in the fertilizer, the chlorine content of leaf tobacco obtained from growers was higher than when the sulfate was used, and the burn was inferior.

The analyses and data from other sources appeared to indicate that while excessive amounts of chlorine are not desirable, a relatively large percentage does not necessarily produce a bad burn. Chlorine may injure the burning quality, but tobacco seldom contains enough to do serious harm. There seemed to be no evidence to support the popular notion that small amounts of chlorine in fertilizers will injure the quality of the tobacco grown, and the existing prejudice against fractional percentages of this element is not held justified. The variation in chlorine content of tobacco grown in different localities would appear due in part, at least, to variation in the amount present in the soil.

Protein survey of 1926 Minnesota wheat crop, R. C. SHERWOOD (*Minn. Dept. Agr. Bul. 52 (1926), pp. 16, figs. 3*).—Samples were collected in the principal wheat area of Minnesota and were examined at the State Testing Mill as in 1925 (E. S. R., 54, p. 536). Hard red spring wheat (1,838 samples) ranged from 8.56 to 17.95 per cent of crude protein, averaging 12.74 per cent. Winter wheat (180 samples) averaged 11.58 per cent, and durum wheat (63 samples) 12.45 per cent.

Hybrid selections of Marquis and Kota: A comparative study with regard to disease resistance, yield, and baking quality, L. R. WALDRON (*North Dakota Sta. Bul. 200 (1926), pp. 64, figs. 11*).—A detailed account is

given of extensive comparative studies made with the spring wheat varieties Marquis and Kota and two of their hybrid (Marquis×Kota No. 5) offsprings, Ceres and No. 1656, during efforts to obtain improved wheat varieties. Marquis and Kota appeared to differ in at least 17 physical and chemical characters. For certain characters two or more factor pairs seemed to be concerned.

During the period 1923–1926 for 85 comparisons at different stations, No. 1656 was found to rust (stem rust) 6.2 per cent less than the rust resistant Kota, and for 63 comparisons Ceres showed 1.8 per cent more rust than Kota. No. 1656 appeared to stand in a definite transgressive position in regard to rust resistance. Certain reselections from No. 1656 on the basis of rust resistance showed a lessened average amount of rust carried than check plantings of No. 1656.

Marquis wheat is slightly earlier than Kota, and No. 1656 and Ceres are both significantly earlier than Marquis. Selections from No. 1656 indicate that at least two pure breeding transgressive segregates for earliness exist in that wheat. Two such segregates seemed to necessitate the assumption that Kota and Marquis are separated by at least four pairs of allelomorphic factors. Both Ceres and No. 1656 are intermediate between the parents in strength of straw and differ significantly in height, No. 1656 being the taller and approaching Kota.

The Kota pure line (No. 5) was hardly significantly higher yielding than bulk Kota. In numerous trials during 1923, 1924, and 1925 Ceres outyielded Marquis and Kota 3.8 and 3.6 bu., or 14.2 and 14.9 per cent, respectively. When yields were grouped (4 classes) according to presence or absence of rust and lodging Ceres outyielded Marquis significantly in all except the group where lodging was severe and rust not severe, and outyielded Kota significantly in all groups. The data indicated that Ceres is a transgressive segregate as to yield, a position apparently resulting from an additive effect of high yielding factors from each parent. No. 1656 generally showed less yielding capacity than Ceres, except when rust was certainly the limiting factor. The lessened yield capacity of No. 1656 seemed in part due to its weaker straw and in particular to low yielding forms contained. Individual selections were obtained that yielded higher and lower than the bulk No. 1656.

The averages for 22 comparative milling and baking trials showed the respective weights per bushel for Marquis, Kota, and Ceres to be 58.4, 60.6, and 60.6 lbs., crude protein 12.1, 12.84, and 12.84 per cent, flour yield 71.61, 75.41, and 74.2 per cent, loaf volume 2,153, 2,304, and 2,247 cc., loaf color 91.8, 92.6, and 93.2 per cent, loaf texture 93.1, 93.1, and 93.6 per cent, flour absorption 58.9, 60.1, and 60 per cent, loaf weight 487, 488, and 490 gm., and ash 0.57, 0.571, and 0.53 per cent. In 15 comparative trials No. 1656 about equaled Kota in weight per bushel; was intermediate between the parents in crude protein content and loaf volume, higher in flour yield, loaf color, and texture, and equal in loaf weight; about equal to Marquis in flour absorption; and lower than either in percentage of ash. The relative flour yield of No. 1656 seemed to indicate the presence of at least two pairs of factors for flour yield distinguishing Marquis and Kota. As a group, selections from Ceres and No. 1656 exhibited markedly less variability in protein content than a miscellaneous group of varieties and hybrid selections. Comparing selections of Ceres and No. 1656, No. 1656 has a significantly higher protein content and a nonsignificant lower loaf volume. The variability of No. 1656 is significantly greater in both cases.

The greater heterozygosity of No. 1656 in relation to Ceres was demonstrated by comparing the variability for 14 characters in 23 cases. The data showing the possibility of securing transgressive segregates with respect to earliness,

yield, disease resistance, and quality of product indicated that marked advances are possible in wheat breeding if proper parental material is made available.

Zonal distribution of species and varieties of wheats in the valley of the river Aragva (Caucasus) [trans. title], M. I. PRIKHOD'KO (PRIHODKO) (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant-Breeding), 16 (1926), No. 4, pp. 135–144; Eng. abs., p. 144*).—The distribution of species and varieties of Triticum according to altitude is shown for the locality indicated.

West Indian yams, R. O. WILLIAMS (*Trinidad and Tobago Dept. Agr. Bul., 21 (1925), No. 1, pp. 1–26, pls. 4, fig. 1*).—Varieties of yams cultivated in Trinidad and Tobago are described, with information on cultural and field practices, comparative yields, and production costs.

Agricultural seed, A. S. LUTMAN (*Vermont Sta. Bul. 259 (1926), pp. 14*).—The tables presented show the guaranty, purity, germination, and weed seed and other crop seed contents for 279 samples of agricultural seed obtained from dealers in Vermont during April, 1926.

Tests on the poisoning of weed seeds [trans. title], G. SAMPIETRO (*Gior. Risic., 15 (1925), No. 11, pp. 168–175*).—When seeds of Onsen rice, *Panicum* spp., and *Cyperus* spp. were immersed for 3 days in solutions of different chemicals, the germinability of the seeds of Panicum was in no case destroyed and that of Cyperus seeds was stimulated. Rice and also Panicum behaved similarly when the solutions remained for 25 days in contact with the seeds during germination, while only single Cyperus seeds germinated in each of the KCN and $K_4Fe(CN)_6$ solutions. The vegetation was normal with solutions of $FeSO_4$ and Na_2CO_3 and mediocre with $CuSO_4$ and $KMnO_4$; that of rice was rachitic with $K_4Fe(CN)_6$ and $KClO_3$ and for Panicum with $K_4Fe(CN)_6$, $KClO_3$, $KMnO_4$, $CaOCl_2$, and KCN. Rice made no growth with KCN, $K_2Cr_2O_7$, lysoform, and $CaOCl_2$ and Panicum none with lysoform and $K_2Cr_2O_7$. The reason for the inferior stature of Panicum vegetation as compared to that of rice seemed because of its lesser reserve matter.

Eradication of the wild onion, C. A. MOOERS (*Tennessee Sta. Circ. 5 (1926), pp. 2, fig. 1*).—Methods are outlined for the eradication of wild onions in fields, old sod land, lawns, and fence rows.

HORTICULTURE

Types and varieties of celery, P. WORK (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 333–337*).—A brief discussion of methods of technique employed at Cornell University in a systematic study of celery varieties. Among the most useful characters for distinguishing varieties were the number of leaves, length of petiole, height, weight, and circumference of the plants, pithiness, suckers, ease in blanching, color of foliage, and cross section of stalks. The six varieties found of greatest importance in the United States were the Golden Self and Easy Blanching, Old and New Vilmorin strains, Golden Plume strain, and Giant Pascal.

Physical and chemical changes in celery during storage, L. W. CORBETT and H. C. THOMPSON (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 346–353*).—Marked changes were noted from week to week during the storage period in the pectic compounds of the middle lamella of Golden Self Blanching celery stalks. Pectic acid and pectin gradually increased at the expense of the less soluble calcium pectate and pectose. Changes were less rapid in plants grown on plats receiving phosphorus and potash in addition to nitrogen than in those from the nitrogen plats. Breaking and cutting tests made at weekly intervals

showed a well-marked decrease in resistance during the first 7 to 10 days of storage, followed by a slow rate of change until the approach of decay. Analyses showed a decline in reducing and total sugars in the leaves and an increase in the stalks during the storage period. At the same time soluble nitrogen increased in both stalks and leaves. The insoluble nitrogen content of the leaves decreased during the entire storage period, while in the outer stalks the decrease ceased after the first month until the onset of decay, which naturally influenced the chemical composition of all parts of the plants. The increase in insoluble nitrogen in the inside stalks from harvest until the end of storage is believed due to translocation from the leaves and outside stalks, a phenomenon which must have been accompanied by the conversion of insoluble into soluble forms.

Horticultural groups of cucurbits, E. F. CASTETTER (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 338–340*).—Pointing out the distinguishing characteristics of the three important species of cucurbits, namely, *Cucurbita pepo*, *C. maxima*, and *C. moschata*, the author classifies 67 varieties studied on the grounds of the Iowa State College into various subgroups under the three main species.

Preliminary notes on tip-burn of lettuce, R. A. McGINTY and R. C. THOMPSON (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 341–346*).—A chemical analysis at the Colorado Experiment Station of healthy lettuce plants and of those in which tipburn was induced by copious watering showed that the percentage of the different sugars was significantly higher in the healthy plants. Furthermore, determinations upon the two lots showed, almost without exception, that healthy plants were higher in the percentage of dry weight. No differences were noted in the pentosan content of the two lots. Since the plants were grown in a single greenhouse, it is concluded that temperature and humidity had no bearing on the development of tipburn, but that abundant soil moisture was the determining factor. The suggestion that excessive transpiration is the cause of tipburn was refuted by the fact that healthy plants placed under bell jars in which the humidity was unusually high soon developed tipburn injury.

***Physiology of reproduction in horticultural plants.—I, Reproduction* and metabolic efficiency in the tomato,** A. E. MURNEEK (*Missouri Sta. Research Bul. 90 (1926), pp. 19, figs. 4*).—A report upon a study of the growth and metabolism, as indicated by chemical determinations, of Bonny Best tomato plants grown under similar nutrient conditions, but divided into three lots as follows: (1) Normal, pollinated and allowed to carry fruits, (2) pollinated but defruited before the fruit reached 1 cm. in diameter, and (3) deflorated before anthesis.

The normal plants made less height growth and, as expressed by the dry weight of leaves, only one-half the total amount of foliage of the other two groups. The defruited plants absorbed the greatest quantities of soil nutrients and synthesized the largest amounts of organic substances. The deflorated plants resembled the defruited in general appearance, but were approximately 10 per cent lower in total fresh and dry weights of the various parts.

Flower buds and fruits were low in ash and crude fiber, but comparatively high in phosphorus, nitrogen, starch, and hemicellulose. In the normal plants approximately 50 per cent of the total phosphorus and nitrogen, 71 per cent of the sugar, and 83 per cent of the starch were concentrated in the fruits. Hence it was apparent that the reproductive organs, particularly the developing fruits, received the greatest stimulus from gametic union. It is pointed out that when a maximum number of embryos and their accessory tissues are permitted to develop, the inevitable result is a retardation or destruction

of further vegetative development, attaining in extreme circumstances the complete death of the plant. The large growth made by the defruited plants is explicable only in the light of the supposition that stimulation in metabolic activity from fertilization extends beyond the immediate region of the floral organs.

The effect of acid phosphate and muriate of potash on the vegetative growth of tomato plants, J. R. HEPLER (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 362–365*).—To determine whether the earlier ripening noted on acid phosphate plats at the New Hampshire Experiment Station (E. S. R., 49, p. 234) was associated with vegetative growth, data were taken upon early growth, total growth, number of flower clusters, and the yield of ripe fruits of Bonny Best tomatoes subjected to differential fertilizer treatments. On July 17 the increased growth on plats receiving 1,000, 500, and 1,520 lbs. of acid phosphate in addition to the basic treatment of 20 tons of manure per acre amounted to 152, 113, and 155 per cent above the control plat. At the same time the use of 20 tons of additional manure yielded only 7 per cent increase, and where muriate of potash was used alone, or with acid phosphate, there was a 14 per cent decrease and a 19 per cent gain, respectively. On July 31 the 1,000, 500, and 1,520 lb. acid phosphate plats carried 138, 103, and 142 per cent more flower clusters than did the check plats, and up to September 17 yielded 346.3, 229.3, and 332.7 per cent more ripe fruits than did the checks. Growth data taken August 7 showed much smaller increases on the phosphate plats, indicating that increased growth due to acid phosphate was largely early growth.

Tomato production, P. WORK (*New York: Orange Judd Pub. Co.; London: Kegan Paul, Trench, Trübner & Co., 1926, pp. 127, pls. 13, figs. 3*).—A concise discussion of tomato growing based upon experimental results and practical experiences.

Pollination and fruiting habit of the watermelon, J. T. ROSA (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 331–333*).—Following a brief discussion of the flowering habit in the watermelon, the author reports that observations upon a large number of varieties growing at the University Farm, Davis, and at Modesto, Calif., showed two distinct groups, namely, those bearing purely staminate and pistillate flowers and those bearing hermaphroditic blooms in place of the purely pistillate ones. The hermaphroditic flowers generally contained three well-developed stamens yielding an abundance of pollen indistinguishable from that of staminate blossoms. However, when bagged prior to anthesis these hermaphroditic blooms failed to set fruit unless hand pollinated, due, in the author's belief, to the sticking of the pollen grains to the anthers following dehiscence. Emasculated and pistillate blooms of several varieties failed to develop fruits when protected from insect visitation, indicating little tendency toward parthenocarpy in the watermelon.

New fruits produced at the University of Minnesota Fruit Breeding Farm, W. H. ALDERMAN (*Minnesota Sta. Bul. 230 (1926), pp. 47, figs. 34*).—Following a brief discussion of the history and development of fruit breeding at the station, descriptions are offered of the more important seedlings, tree and bush fruits, and ornamentals which have resulted from these activities.

A record system for fruit breeding work, A. N. WILCOX (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 269–271*).—A brief discussion of methods employed at the Minnesota Experiment Station in labeling pollinated blossoms and keeping records upon the resulting seedlings.

Tests show how to remove spray residue, H. HARTMAN and R. H. ROBINSON (*Better Fruit, 21 (1927), No. 7, pp. 5, 6, 16*).—Of a considerable number of compounds tested at the Oregon Experiment Station as possible media for removing

spray residues from apples and pears, hydrochloric acid used at concentrations ranging between 0.25 and 2 per cent was found most effective and satisfactory. Among advantages cited are cheapness, effectiveness at low temperatures, nonoxidizing properties, volatility, easy removal from fruit, and noninjurious qualities.

Removal of arsenate of lead from sprayed fruit, W. P. Headden (*Colorado Sta. Press Bul. 63 (1926), pp. 4*).—Finding that hand and machine wiping machines such as exist are not satisfactory for removing arsenical residues from apples, a bath was devised, made up of 4 lbs. each of soda ash (Na_2CO_3) and common salt (NaCl) dissolved in 12.5 gal. of water. When maintained at a temperature of 100° F., this was found highly effective, provided the solution was gently agitated. Not less than 5 nor more than 10 minutes were required, following which the apples were rinsed with fresh water. The resulting fruits not only satisfied the necessary requirements, but were attractive in appearance.

Pollination studies with certain New York State apple varieties, L. H. MacDaniels (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 87–96*).—Records taken in the spring of 1925 at Cornell University upon the set of fruit on McIntosh, Cortland, and Baldwin apple trees inclosed in mosquito-net tents containing a hive of bees showed McIntosh to be practically self-sterile, Cortland sterile, and Baldwin self-fertile. The introduction of foreign pollen showed McIntosh × Rhode Island to be intersterile and McIntosh × Cortland interfertile. Counts of seeds in the resulting fruits showed sharp reductions below those of control trees exposed to open pollination. Germination studies with pollen of the experimental and other trees showed 24, 9, 13, 83, 89, and 12 per cent of average germination, respectively, for McIntosh, Baldwin, Rhode Island, Golden Delicious, Delicious, and Arkansas. Cortland pollen germinated as high as 75 per cent. A large portion of imperfect pollen grains was found in those varieties with low pollen germination. The author suggests that the several varieties may have different optimum temperatures for pollen tube growth and hence varieties probably vary in their effectiveness as pollinizers in accordance with the weather.

First 20 years of a variety apple orchard; apple cion selection, M. B. Cummings and E. W. Jenkins (*Vermont Sta. Bul. 255 (1926), pp. 32, pls. 4, figs. 2*).—A further report (E. S. R., 45, p. 835) upon variety and miscellaneous studies conducted in the station apple orchard, planted in 1905. Grass-mulch treatment, utilized from the sixteenth to twenty-first years was not equal, even when supplemented with fertilizer applications, to tillage. Light annual pruning of diseased and crowding limbs sufficed to keep the trees in good condition during the later years. A cylinder of galvanized wire cloth, 12 strands to the inch, proved successful, when pressed several inches into the soil, in protecting the trees from mice and from borers. Records taken on 27 varieties during the 20 years showed but little difference in the total production of annual and alternate year producers. Of standard varieties, Yellow Bellflower was the most productive, closely followed by Fameuse, Red Astrachan, and Shiawassee. Yellow Transparent, a filler variety, was the most productive of all. Within varietal limits, trunk diameter, head diameter, and the height of the tree were correlated with productivity.

A second report upon the study of the relative value of 268 apple scions derived in part from high and in part from low yielding parent trees failed to show any significant results attributable to parentage.

Investigations in cool storage, C. E. Baker (*Ind. Hort. Soc. Trans., 1925, pp. 58–71*).—Studies by the Indiana Experiment Station in an air-cooled storage cellar showed that natural air cooling is not sufficient to keep Grimes and

Jonathan apples from rapid ripening. The addition of ice during September and October reduced temperatures from 12 to 18° F. below that of a comparable uniced chamber, and the fruit in the iced chamber kept considerably longer. However, as the temperature of the iced compartment averaged approximately 56° during September, whereas the ideal temperature for apples is 31 to 32°, the author considers icing to be impractical from the commercial viewpoint. In concluding, the author points out the necessity of careful ventilation and the advisability of introducing fruit into the storage cellar in the early morning. The use of shredded oiled papers as a medium for preventing scald in Grimes and York Imperial is discussed.

Use of leaf characters in identification of plum varieties, W. H. ALDERMAN and J. S. SHOEMAKER (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 264–269*).—A careful study of the leaves located about midway the length of strong-growing shoots showed varietal distinctions sufficiently clear to be used in the identification of plums. A key for identifying Minnesota plums is presented .

Two years' results on the effect of nitrate of soda on the yield of strawberries, S. W. WENTWORTH (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 358–362*).—Due to soil heterogeneity and other causes, fluctuating results were obtained in 1923 from the use of different sized and timed applications of nitrate of soda upon Senator Dunlap strawberries growing at the New Hampshire Experiment Station. However, in the case of Premier plants set in the spring of 1923 as an intercrop in a young apple orchard which had been fertilized with 10 tons of manure per acre in 1922 for sweet corn, differential nitrate treatments gave marked results. Plants receiving 300 lbs. of nitrate of soda per acre on September 1 and those receiving 100 lbs. July 31, August 18, and May 26 of the succeeding year yielded 18.4±5.3 and 16.8±8 per cent less fruit than control plants, whose yield was estimated on the basis of performance of neighboring checks. Leaf area measurements showed those of the nitrated plants to be 20 per cent larger than those of the check plants. However, the leaves of nitrated plants showed a much greater tendency to wilt, a fact which is suggested as a possible cause of the crop decrease on the nitrated areas.

The capsules, seeds, and seedlings of the orange day lily, A. B. STOUT (*Jour. Heredity, 17 (1926), No. 7, pp. 243–249, figs. 4*).—Failure to secure seeds from self- and interpollinations of various stocks of *Hemerocallis fulva* led to the suggestion that *fulva* lilies are simply vegetative propagations from a single original seedling and hence constitute a clon. Of over 7,000 flowers of the *fulva* clon crossed with pollen of other Hemerocallis species, only 23 yielded mature capsules, containing 70 seeds, of which only 11 germinated. Records of success with *fulva* as a pollen parent are also very scanty. As both pollen and pistils appear perfect in the *fulva* lily, the author believes that sterility in this group involves incompatibilities in fertilization and may, perhaps, be overcome at some time by the discovery of a truly compatible form.

A handbook of flowering trees and shrubs for gardeners, R. C. NOTCUTT, edited by W. R. DYKES (*London: Martin Hopkinson & Co., 1926, pp. VII+246, pls. 24*).—Brief descriptive and cultural notes are given on a large number of flowering trees and shrubs.

FORESTRY

Studies in tolerance of New England forest trees.—V, Relation of the moisture content of the soil to the sensitiveness of the chloroplast to light, G. P. BURNS (*Vermont Sta. Bul. 257 (1926), pp. 16, figs. 8*).—In this fifth contribution to the general subject (E. S. R., 50, p. 343), the author reports that a

current assumption that the amount of light required for photosynthesis increases as the soil moisture content decreases was not borne out in laboratory studies with young conifers, the tops of which were inclosed in sealed jars containing a known amount of carbon dioxide and the roots in pots of soil the moisture content of which was subject to change. Constant light was furnished by four Nela Trutint lamps placed about the tree. Under constant light and decreasing soil moisture, there actually occurred an increase in photosynthetic activity as the moisture content reached a critical point. In Scotch pines this increase took place at about an 8 per cent moisture content. There was no apparent indication that photosynthetic activity decreased as the soil moisture content was lowered.

The author points out that the data obtained in the studies tend to show a certain independence of light and soil moisture so long as neither become a limiting factor. In fact a decrease in moisture content of the soil did not affect photosynthetic activity until after the tree began to perish from a lack of water.

The growth of the oak in relation to the weight of the acorn [trans. title], G. [R.] EITINGEN (*Forstwiss. Centbl., 48 (1926), No. 24, pp. 849–863, figs. 3*).—Measurements taken upon 165 5-year-old oak trees resulting from acorns which previous to planting were assorted into three grades, the average weights of which were 2.2, 4.7, and 7.2 gm., showed average values for height in centimeters of 44.1±0.9, 68.4±1.2, and 82.5±1.3, respectively. Measurements taken three years later on other trees of the same lot, but derived from acorns averaging 2.2, 5, and 8 gm. in weight, showed average height values of 109.1±0.3, 136.7±0.3, and 143.5±0.4 cm., respectively, indicating that the differences due to the size of the acorns tended to diminish as the trees increased in age.

The larger oaks not only exceeded the smaller ones in height, but also in diameter of the trunk and in the number of young shoots. At the age of 5 years oaks derived from small, medium, and large acorns averaged 7.4±0.2, 10.1±0.2, and 11.4±0.2 mm. in diameter at the base, and at 8 years 11±0.3, 12.6±0.3, and 14.1±0.4 mm., respectively. The average weights of the aboveground portion of 5-year-old trees without leaves were 8.8±0.4, 23.3±1.2, and 33.1±1.3 gm. for small, medium, and large trees, respectively. The weights of the air-dried leaves of 5-year-old trees were 5.2±0.2, 7.1±0.3, and 8±0.3. The number of leaves were 73.2±3.7, 96.5±5.4, and 99.5±4.2.

Although it is expected that the stimulating effect of large acorns would gradually reach 0 in open plantings, the author points out that in dense stands this original superiority would give the young oak a decided advantage and lead to the ultimate suppression of the small trees resulting from small acorns.

The identification of furniture woods, A. KOEHLER (*U. S. Dept. Agr., Misc. Circ. 66 (1926), pp. 76, pls. 30, figs. 4*).—Devoted principally to the structure, coloration, figuration, and uses of the woods commonly used in furniture manufacture, this paper discusses in a general way the selection of wood for furniture making, the amounts and kinds used, the structure of woods, methods of cutting, figures in wood, veneers, rules for nomenclature, the effect of atmospheric changes on furniture, etc. A key for the identification of woods used for the exposed parts of furniture is included.

DISEASES OF PLANTS

Plant pathology on an anatomical-physiological basis [trans. title], H. M. QUANJER (*Angew. Bot., 6 (1924), No. 2, pp. 225–232*).—Chiefly this note compares contributions by about 22 authors, with reference also to related accounts by himself (E. S. R., 52, p. 748; 53, p. 244).

Wisconsin studies upon the relation of soil temperature to plant disease, L. R. JONES, J. JOHNSON, and J. G. DICKSON (*Wisconsin Sta. Research Bul. 71 (1926), pp. 144, figs. 59*).—A summary is given of contributions of the Wisconsin Station on the relation of soil temperature to plant diseases, most of the work having been carried on at the Plant Pathology Laboratory of the station between 1916 and 1926. The data have been brought together in order that there may be given a unity of conception and method of the work on the effect of temperature on host plants and parasites and of development of diseases.

Data and perspectives of biological researches on parasitic fungi, 1850 to 1925 [trans. title], A. N. BUKHGEĬM (BUCHHEIM) (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 2 (1925), No. 9, pp. 560–565; Ger. abs., p. 565*).—The author reports regarding progress in the field of experimental biology of parasitic fungi during 1850–1925, emphasizing their specialization and change (extension) as regards host range. It is emphasized that the resistance of plants to certain parasites is influenced in very high degree by conditions in the external medium.

Mycology [India], W. MCRAE (*India Bd. Sci. Advice Ann. Rpt. 1922–23, pp. 31–35*).—Accounts are given in brief detail of conditions and work regarding economic plant diseases in several places or divisions throughout India.

Longevity of cultures of fusaria, W. E. MANEVAL (*Phytopathology, 14 (1924), No. 9, pp. 408–410*).—Stock cultures of *Fusarium conglutinans, F. niveum, F. oxysporum, F. vasinfectum, F. discolor, F. gibbosum, F. coeruleum, F. solani, F. trichotecioides*, and *F. discolor sulphureum* in plugged test tubes were placed in an ice box in the spring of 1916, where they remained until March, 1924, when cultures were made of them and all but *F. coeruleum* and *F. discolor sulphureum* grew. After having been preserved for approximately 8 years, most of the time at a temperature near 10° C., 8 out of the 10 species grew more or less readily, indicating for field control the necessity of long periods of rotation for the eradication of these species, even where there is no new growth.

The effect of hydrogen-ion concentration on the extracellular pectinase of Fusarium cromyophthoron, C. P. SIDERIS (*Phytopathology, 14 (1924), No. 11, pp. 481–489*).—Tests were made of the effect of the pectinase of *F. cromyopthoron* contained in the filtrate from liquid media of different H-ion concentrations and growth periods on the maceration of onion disks and on the hydrolysis of pure pectin. The amount of pectinase, as measured by its action, secreted in the different cultures was found to vary with the age of the culture and the H-ion concentration of the medium. The age of the culture influenced the permeability or impermeability of the cells of the fungus to pectinase. The H and OH ions likewise influenced the rate of pectinase excretion.

The viability of uredospores, W. E. MANEVAL (*Phytopathology, 14 (1924), No. 9, pp. 403–407*).—Experiments of the author with uredospores of *Uromyces striatus, Puccinia sorghi, P. coronata, P. menthae americana*, and *U. caryophyllinus* and cited work of other investigators are said to indicate that these species and also *P. helianthi* and *Cronartium ribicola* retain their viability for at least six months at rather cool temperatures and with moderate humidity. It is considered probable that under certain conditions these and other species of rusts retain their ability to infect their host plants after a winter rest period. It is believed that such rusts as those of corn, alfalfa, and oats may overwinter in the uredo stage, be disseminated, and become established in the spring.

Measuring water flow interference in certain gall and vascular diseases, I. E. Melhus, J. H. Muncie, and W. T. H. Ho (*Phytopathology, 14 (1924), No. 12, pp. 580–584, fig. 1*).—A form of apparatus designed to measure the interference of water flow through vascular tissues is described. By means of this device it was found that the vascular distortion caused by crown gall (*Bacterium tumefaciens*) in the trees studied induces sufficient interference to reduce the rate of water flow 30 per cent. The wilting incident to field infection of cabbage with *Fusarium conglutinans* was found to be due to a partial or complete stoppage of the ducts in the vascular system. Alfalfa wilt also results from a vascular plugging.

Fungi causing rots of fruits and bulbs [trans. title], J. Trzebiński (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Pulawach (Mém. Inst. Natl. Polon. Écon. Rurale Pulawy), 4 (1923), A, No. 4, pp. 1–49, figs. 4; Fr. abs., pp. 44–49*).—*Penicillium glaucum* (*P. crustaceum*) is made prominent among several organisms discussed as noted in connection with rotting diseases of fruits and of bulbs.

The alternate hosts of crown rust, Puccinia coronata Corda, S. M. Dietz (*Jour. Agr. Research [U. S.], 33 (1926), No. 10, pp. 953–970, figs. 4*).—Thirteen species and one variety of Rhamnus, indigenous to the United States, and three species native to Europe were investigated as possible alternate hosts of crown rust. Normal infection was secured in at least one trial when teliospores from *Avena sativa* were transferred to *R. californica tomentella, R. caroliniana, R. cathartica, R. ilicifolia, R. lanceolata, R. pachyphylla, R. pinetorum, R. rubra,* and *R. smithii.* The following species were found also susceptible, and it is claimed that they may function as alternate hosts of the Avenae form of *P. coronata*: *R. alnifolia, R. californica, R. crocea, R. dahurica,* and *R. tinctoria. R. frangula, R. nevadensis,* and *R. purshiana* showed marked resistance to the physiologic form on oats.

Normal infection was secured by inoculation with teliospores from *Calamagrostis canadensis* on *R. alnifolia, R. californica, R. crocea, R. lanceolata,* and *R. smithii.* It was found that *R. californica tomentella, R. cathartica, R. pinetorum,* and *R. rubra* may function as alternate hosts of this physiologic form. The other eight species showed marked resistance.

Teliospores from *Festuca elatior* caused normal infection on *R. alnifolia, R. californica, R. cathartica,* and *R. lanceolata.* Only a few aecia were produced on *R. californica tomentella, R. caroliniana, R. crocea, R. rubra,* and *R. smithii.* Twelve trials on the remaining seven species showed that *R. ilicifolia* produced pycnia and *R. pachyphylla* developed flecks only. Teliospores from *Notholcus lanatus* produced pycnia on *R. lanceolata.*

Ceanothus americanus, Lepargyrea argentea, and Zizyphus lycioides did not respond as alternate hosts of the crown rust. *Berchemia scandens* was infected with teliospores from oats. *L. canadensis* produced aecia when exposed to infection with teliospores from *Calamagrostis purpurascens.*

The different Rhamnus species, functioning as alternate hosts, are said to alter the physiologic response of specialized forms.

The author states that during nine years in Iowa aecial infection appeared on *R. cathartica* and *R. lanceolata* previous to the development of uredinia on oats, and these two species of Rhamnus are considered to have been instrumental in starting local and general epidemics in Iowa within the past two years.

Studies on the operation of phytopathological pickling fluids [trans. title], H. Lundegårdh (*Biol. Zentbl., 44 (1924), No. 9, pp. 465–487, figs. 9*).—The finding regarded as the most significant resulting from this investigation

is that the physiological action of the Cu and Hg ions, absorbed by the seed used, show periodical alterations with increase of quantity.

The behavior of fungicides [trans. title], H. LUNDEGÅRDH (*Nord. Jordbrugsforsk., 1925, No. 5, pp. 209–223, figs. 6*).—Absorptivity by seeds of fungicides and results are shown graphically with discussion, relating partly to the work above noted.

Seed treatments [trans. title], W. LANG (*Angew. Bot., 6 (1924), No. 2, pp. 335, 336*).—This is a reply to the report of Gabel previously noted (E. S. R., 52, p. 49).

Streak disease of Gramineae in Mauritius [trans. title], E. F. S. SHEPHERD (*Rev. Agr. Maurice, No. 22 (1925), pp. 540–542*).—The author's attention was directed by G. Orian in April, 1925, to the presence in Mauritius of a mottling or striping sugar cane disease supposedly unknown previously on that island, and thought to be identical with streak disease as reported for portions of South Africa by Storey (E. S. R., 53, pp. 47, 546; 54, pp. 246, 250, 251) and by the present author (E. S. R., 54, p. 250), who now states as the results of experimentation herein briefly noted that the streak disease is propagated at last in the planting material.

Physiological specialization of Ustilago hordei, J. A. FARIS (*Phytopathology, 14 (1924), No. 12, pp. 537–557, fig. 1*).—In a previous paper (E. S. R., 55, p. 544) the author showed the effect of certain environmental conditions on the infection of barleys by *U. hordei*. In the progress of his investigations evidence of biological specialization was observed, and subsequent studies have shown definitely the existence of five biological forms of the fungus, with some indications of other forms.

Additional experiments on environmental relations showed that dehulling barley seed tended to increase infection, and it also reduced the stand. The character of the soil proved important in securing infection. High infections were secured over a wide range of soil moisture.

The author concludes that his studies show that the factors limiting infection may be environmental or biological, and that they may be exerted on the parasite or the host or on the relation between the two.

Physiologic specialization in Puccinia graminis avenae Erikss. and Henn., D. L. BAILEY (*Minnesota Sta. Tech. Bul. 35 (1925), pp. 33, pls. 5*).—Extensive collections of stem rust of oats were made and cultivated in the greenhouse, the reaction of a large number of varieties of oats to the cultures was determined, and physiological forms of rust were isolated and their reaction to differential hosts studied. Five physiological forms of *P. graminis avenae* were recognized, and in addition to differences in parasitism morphological differences were found. In addition to their infection capabilities of oats the grass-host range of the different forms is reported upon. Of the five forms recognized, one was of Swedish origin not yet found in North America; the second form was represented by cultures, one from Sweden and one from South Africa, neither of which is found in this country; while forms 1, 2, and 5 are said to be widely distributed throughout the United States and Canada.

Field tests of a large number of oat varieties were made at Indian Head, Saskatchewan, and at Brandon and Winnipeg, Manitoba. The uniform susceptibility of all the varieties, except White Tartar and Richland, is said to indicate the possible presence in these localities of forms 1, 2, and 5, and the definite absence of forms 3 and 4. Infection of the variety Victory, which is susceptible to all five physiological forms, is said to proceed in a manner similar to that of wheat varieties susceptible to *P. graminis tritici*. The resistance of Richland is thought to be not entirely dependent on morphological

characters. The mode of infection is said to be much the same as in a susceptible variety, except that pronounced local killing of the infected tissue seems to limit the development of the fungus.

Oat loose smut, Ustilago avenae: Biological researches, with particular reference to questions of infection and susceptibility [trans. title], A. ARLAND (*Bot. Arch., 7 (1924), No. 1–2, pp. 70–111, figs. 10*).—The material employed in the present study was obtained from *Avena sativa* and *A. nuda* in August, 1924. The conditions, methods, and data are systematically presented, with about 90 references to related literature.

Some diseases of wheat crops and their treatments, W. J. SPAFFORD (*So. Aust. Dept. Agr. Bul. 190 (1925), pp. 16*).—Wheat diseases, here listed, with brief discussion also of protective measures, include stinking smut (*Tilletia tritici*), loose smut (*Ustilago tritici*), flag smut (*Urocystis tritici*), take-all (*Ophiobolus graminis*), foot rots (*Helminthosporium* spp. and *Wojnowicia graminis*), red rust (*Puccinia graminis*), and wheat mildew (*Erysiphe graminis*).

Varietal susceptibility of wheat to Tilletia laevis, G. M. REED (*Phytopathology, 14 (1924), No. 10, pp. 437–450*).—A report is given of studies begun in 1913 on the resistance of varieties of winter wheat to infection by *T. laevis*. The more common winter wheats grown in Missouri were tested, and all proved to be susceptible to bunt. In some early experiments wide variation was noted in the degree of susceptibility, and this was thought to be correlated with the dates of seeding, the early sowings being less affected. Experiments were conducted to determine the relation of temperature and moisture conditions to the incidence of disease, but it was found impossible to correlate the results with any definite temperature or soil condition. The author believes that soil moisture, soil temperature, and possibly other soil conditions are interdependent factors which determine the occurrence of bunt in wheat.

From the varying reactions observed in different years it is concluded that experiments to determine the resistance of plants to particular diseases should be repeated over a series of years under a wide range of conditions before conclusions are drawn.

Methods of eradicating the common barberry, N. F. THOMPSON and W. W. ROBBINS (*U. S. Dept. Agr. Bul. 1451 (1926), pp. 46, pls. 13, fig. 1*).—Detailed accounts are given of studies on barberry eradication by digging and by the use of chemicals, the practical results having been noted previously (E. S. R., 49, p. 146; 52, p. 546).

Digging was not found to be altogether satisfactory, and cutting and grazing did not destroy the plants.

Experiments were conducted with 37 different chemicals, including inorganic salts, acids and acid formers, gas-forming substances, and oils and other organic substances. In the use of solutions the best results followed the application of the chemical as a drench about the base of the plant, whereas with dry substances, such as salt, the best results were obtained by piling them around the base.

The authors state that, all factors considered, common salt proved the most satisfactory chemical for killing the common barberry. Kerosene and sodium arsenite in solution ranked second and third, respectively, in efficiency. Sodium arsenite, although very effective, is not recommended for general use because of the danger to livestock.

The influence of soil temperature and soil moisture on the development of yellows in cabbage seedlings, E. C. TIMS (*Jour. Agr. Research* [*U. S.*], *33 (1926), No. 10, pp. 971–992, figs. 11*).—In continuation of previous studies of the yellows disease of cabbage caused by *Fusarium conglutinans* (E. S. R., 54, p.

846), the author gives the results of his investigations on the influence of soil temperature and soil moisture on the development of the disease in resistant and susceptible strains of cabbage seedlings.

It was found that young seedlings of Wisconsin All Seasons and commercial All Seasons strains were almost equally susceptible to yellows up to the age of 20 days. A high percentage of plants of the most resistant varieties became diseased when placed under conditions of low soil moisture and relatively high soil temperature. Cabbage plants of both resistant and susceptible strains grown in healthy soil at from 12 to 16° C. before transplantation to diseased soil at a higher temperature (27°) proved to be more susceptible to yellows than plants grown at from 25 to 28°. Air temperature was found to affect yellows development independently of soil temperature. At a soil temperature of 27° the disease developed most rapidly in the 25° chamber and slightly more slowly in the 19 and 14.5° chambers, but the final percentage of disease was about equal in the three. At a soil temperature of 21° the disease developed most rapidly in the 25° room and less rapidly in the 19° room, and the disease was very slight in the 14.5° room. Commercial Hollander plants were grown in diseased soil at a soil temperature of 21° and at air temperatures of 14 and 28°. Yellows developed much more rapidly, a larger percentage of plants was diseased, and a much greater number of plants were killed at an air temperature of 28° than at 14°.

A study of field conditions for two years, supplemented by a limited amount of greenhouse investigation, is said to have shown that the quantity of rainfall apparently affects the amount of disease independently of soil temperature relations.

Diseases of maize and notes on a parasitic maize weed in Kenya, J. McDonald (*Kenya Colony Dept. Agr. Bul. 4 [1925?], pp. [1]+6, pl. 1*).—The outline presented of maize diseases includes ear rot (*Gibberella saubinetii*), head smut (*Ustilago reiliana*), leaf blight (*Helminthosporium turcicum*), and rust (*Puccinia sorghi*). The parasitic weed *Striga hermonthica* is said to occur only in Kenya in the Nyanza Province, where it has been reported on maize, sugar cane, and sorghum.

Control of cucumber mosaic by eradication of wild host plants, S. P. Doolittle and M. N. Walker (*U. S. Dept. Agr. Bul. 1461 (1926), pp. 15, pls. 3*).—In extension of previous reports (E. S. R., 54, p. 346; 56, p. 49) the authors give the results of five years' field experiments on the control of mosaic of cucumbers by the eradication of the wild host plants on which it overwinters.

The authors state that when the experiments were begun it was known that mosaic was carried in the seed of the wild cucumber, *Micrampelis* (*Echinocystis*) *lobata*, and as the work progressed it was found that the disease overwintered in the roots of milkweed (*Asclepias syriaca*), pokeweed (*Phytolacca decandra*), ground cherry (*Physalis heterophylla* and *P. subglabrata*), and catnip (*Nepeta cataria*). Some of these hosts are said to occur in all the cucumber-growing regions of the Eastern and Central States. Mosaic was found to be transmitted from the wild cucumber to the cultivated cucurbits by the striped beetle, *Diabrotica vittata*, and to a lesser degree by the 12-spotted beetle, *D. 12-punctata*. The melon aphis, *Aphis gossypii*, is said to act as the chief agency of dissemination from the other wild host plants.

Experiments which were carried on in Illinois and Wisconsin included groups of from 8 to 17 fields where mosaic had been prevalent in previous years. In view of the results obtained, it is believed that cucumber mosaic can be controlled by the eradication of wild hosts, if the work is done with care and continued throughout the season.

Studies on disease resistance in the onion, J. C. WALKER (*Natl. Acad. Sci. Proc., 11 (1925), No. 3, pp. 183–189, fig. 1*).—The studies here summarized contribute to the general subject of disease resistance in plants, the causes of which resistance appear from recent investigations cited to be widely varied and relatively complex when compared with certain cases or forms of resistance or immunity in animals.

Horticultural varieties of onion (*Allium cepa*) are grouped with respect to pigment dissolved in the cell sap into white (pigment negligible), yellow (flavone derivatives present in outer epidermis), and red (epidermal anthocyan, flavone derivatives also present). Diseases dealt with were smudge (*Colletotrichum circinans*), neck rot (*Botrytis allii* and *Botrytis* sp.), and black mold (*Aspergillus niger*), all of these organisms passing part of their life cycle as saprophytes on dead organic material on or in the soil, but infecting the living fleshy storage tissues of the scales in the the mature bulb and causing gradual decay during storage. Resistance of both yellow and red onion varieties to smudge becomes evident before harvest. No consistent evidence of varietal resistance to black mold has been noted. As regards neck rot, the white varieties always led in susceptibility. The present work, as here detailed, dealt largely with the correlation between coloration and susceptibility to the diseases mentioned.

From the results shown it is concluded that the resistance of colored bulbs to smudge and neck rot is due to a certain substance, readily soluble in the sap of the outer scales of such varieties and toxic to certain disease organisms. In experimentation, the substance becomes functional by dissolving into the infection drop and inactivating the fungus before penetration can take place. The nature of this inactivating substance, its origin, and associations are discussed. The possibility that the coloring substance itself is actually the agent toxic to the organism is not easily tested to a positive conclusion. The toxic substance may be a soluble derivative of quercetin, probably a glucoside not easily isolated in its original form by ordinary chemical methods.

Botrytis neck rots of onions, J. C. WALKER (*Jour. Agr. Research [U. S.], 33 (1926), No. 10, pp. 893–928, figs. 6*).—In a previous publication the author described neck rots of onions caused by *Botrytis* spp. and suggested some means of control (E. S. R., 53, p. 351). In the present contribution three species of Botrytis, *B. allii*, *B. byssoidea*, and *B. squamosa*, are described as causing related but distinct neck-rot diseases.

The author confirmed the claim of Munn (E. S. R., 38, p. 450) that colored varieties are less subject to attack than are white varieties. When infection once occurs, however, decay is said to proceed with equal rapidity in both types. It is said that the disease may be controlled in a large measure by the use of colored varieties. Artificial curing of the bulbs after harvesting so as to desiccate rapidly the neck tissues is also effective in checking the disease.

Fusaria causing bulb rot of onions, G. K. K. LINK and A. A. BAILEY (*Jour. Agr. Research [U. S.], 33 (1926), No. 10, pp. 929–952, figs. 8*).—Descriptions are given of bulb rot of onions caused by several species of Fusarium, the characteristics of the disease being essentially the same as those described by Walker and Tims (E. S. R., 52, p. 348).

The authors claim that a bulb rot of onions caused by *Fusarium* spp. occurs widely in the field and after harvest both in transit and in storage. Red, yellow, and white varieties were equally susceptible, and decay was readily produced when bulbs were inoculated in wounds. The species which cause onion bulb rot are considered to be specialized pathogenes attacking only species

of Allium. In this paper descriptions are given of *F. zonatum* form 2, *F. cepae*, and *F. zonatum* form 1. *F. bulbigenum* was not found to be consistently pathogenic, and *F. moniliforme* is reported to be pathogenic at times.

Controlling onion smut with Kalimat, P. J. ANDERSON (*Phytopathology, 14 (1924), No. 12, pp. 569–574*).—Previous investigations reported by the author showed that under certain soil conditions formaldehyde, used for the control of onion smut (*Urocystis cepulae*), caused considerable loss through reduced stand (E. S. R., 54, p. 545). Later tests were made in which formaldehyde and Kalimat were compared. As a result of two years' experiments, it is claimed that Kalimat controlled onion smut as well as formaldehyde, and it was safer to use in concentrated solutions or in very dry soils. A somewhat better stand was also secured, which may have been due to the more complete destruction of the soil organisms and not to stimulated germination. The present cost of Kalimat is considered rather high for its extensive use.

Potato diseases, G. B. SANFORD (*Alberta Univ., Col. Agr. Bul. 5 (1924), pp. 34, figs. 22*).—The several main divisions of this bulletin as indicated deal in varying detail with fungus diseases, bacterial diseases, insect injury, injury caused by factors of environment, degeneration diseases of obscure causation, the seed plat and disease control, certified seed, methods for seed treatment and sprays, and general recommendations.

Methods of studying the degeneration diseases of potato, D. ATANASOFF (*Phytopathology, 14 (1924), No. 11, pp. 521–533*).—The author outlines methods of investigation and offers suggestions which are designed to simplify and aid in studies of the virus diseases of the potato plant.

Standardizing of degeneration diseases of potato, H. M. QUANJER (*Phytopathology, 14 (1924), No. 11, pp. 518–520*).—The desirability of standardizing the symptoms of various degeneration diseases of potatoes is pointed out, and attention is called to the overlapping of symptoms of forms of mosaic and other diseases on different varieties of potatoes.

Three serious cane diseases not yet reported from the British West Indies, S. F. ASHBY (*West Indian Agr. Conf., Kingston, Proc., 9 (1924), pp. 84–89*).—Attention is called to the significance of three cane diseases, Fiji or leaf gall disease, leaf stripe or Sclerospora disease, and gumming or Cobb's disease. Only the last named has been found, it is stated, in the West Indies, this having been detected in Porto Rico in 1920 and to be known to have spread considerably since that time.

Mosaic disease of sugar-cane, C. G. HANSFORD (*West Indian Agr. Conf., Kingston, Proc., 9 (1924), pp. 76–82*).—Sugar cane mosaic is said to have been first noted in Java about 1890, but to have been regarded as simply an undesirable variation. It became serious in Porto Rico in 1917–1921, in Jamaica since 1920, and in Cuba since 1921. A list of known hosts is given. The disease is spread by planting diseased material and by transmission from diseased to healthy plants. Losses range from 30 up to 50 per cent. The relation of this disease to canes differing in susceptibility is discussed.

Java gum disease of sugar cane identical to leaf scald of Australia, D. S. NORTH and H. A. LEE (*Phytopathology, 14 (1924), No. 12, p. 587*).—The authors claim the identity of the leaf scald of sugar cane in Australia with the gum disease of Java described by Wilbrink (E. S. R., 45, p. 146). On account of the possible confusion with the gum disease described by Cobb (E. S. R., 7, p. 513), the authors suggest the retention of the Australian name. This disease, which is considered one of the most destructive diseases of the sugar cane, is known to occur only in Australia, Fiji, Java, and the Philippines.

Histology and cytology of sugar cane matizado [trans. title], M. T. Cook (*Rev. Agr. Puerto Rico, 15 (1925), No. 6, pp. 291–293*).—The conclusion to this brief account asserts agreement with the findings reported by Kunkel (E. S. R., 51, p. 449) regarding the presence of intracellular bodies in mosaic plants, although no claim is made as to the actual agency of these bodies in mosaic causation.

The use of sulphur as a fungicide and fertilizer for sweet potatoes, J. F. Adams (*Phytopathology, 14 (1924), No. 9, pp. 411–423, figs. 4*).—Two seasons' experiments covering a considerable number of individual tests with inoculated sulfur applied alone to soils or in connection with fertilizers are said to indicate that inoculated sulfur is valuable in the control of certain soil diseases of sweet potatoes, and that it also acts as a fertilizer.

Practical control of scurf was secured, and pox and black rot were reduced in the field, as well as the development of these diseases in storage. The yields were also increased where sulfur was used.

Evidence was secured that indicated a relation between soil reaction and disease control and increased yields. With a decrease in the pH exponent and an increase in the H-ion concentration the prevalence of disease diminished and yields increased.

Under the conditions of the experiments, an application of 300 lbs. of inoculated sulfur per acre was the maximum quantity required for practical disease control and increased yields.

Tobacco leaf diseases [Porto Rico] [trans. title], M. T. Cook (*Rev. Agr. Puerto Rico, 15 (1925), No. 6, p. 282*).—*Cercospora nicotianae*, only, is briefly discussed.

Tobacco mosaic in Southern Rhodesia, F. Eyles (*Rhodesia Agr. Jour., 23 (1926), No. 3, pp. 248–252*).—The presence of tobacco mosaic in Southern Rhodesia is regarded as certain, and in some years severe crop damage is thought to be attributable to this disorder. It is assumed that the causal agent of tobacco mosaic may overwinter, or may originate, in some Rhodesian weed or weeds. Information and discussion, as herein presented, refer also to other diseases of widespread occurrence and undetermined causation, often referred to as virus diseases.

Bacterial soft-rot of tomato, S. A. Wingard (*Phytopathology, 14 (1924), No. 10, pp. 451–459, figs. 3*).—A study was made of a bacterial soft rot of tomato fruits that is reported to have been of considerable importance in Virginia.

The disease was found to be caused by *Bacillus aroideae* (E. S. R., 16, p. 270). The organism is said to be a wound parasite, and green tomatoes are more susceptible to injury than ripe ones. All varieties tested were about equally affected. Losses due to this disease were appreciably reduced by spraying with soap-Bordeaux mixture.

A study of Bacillus aroideae, the cause of a soft rot of tomato, and B. carotovorus, A. B. Massey (*Phytopathology, 14 (1924), No. 10, pp. 460–477, figs. 3*).—Comparative studies of *B. aroideae* (E. S. R., 16, p. 270) and *B. carotovorus* (E. S. R., 13, p. 362) are said to indicate that these species are distinct although closely related.

Cellular interaction between host and parasite, C. H. Farr (*Phytopathology, 14 (1924), No. 12, pp. 575–579, figs. 12*).—A method is described for the direct observation of the growth reaction of hosts and parasites. By this method the author observed the reaction of *Fusarium lycopersici* toward the roots of several varieties of tomato susceptible and resistant to wilt.

Pathologic histology of apple blotch, E. F. GUBA (*Phytopathology, 14 (1924), No. 12, pp. 558–568, pls. 2, figs. 5*).—The gross histology of tissues of twigs, fruit, and leaves infected by *Phyllosticta solitaria* is described. On account of failure of the author's efforts to obtain artificial infection, some points in the pathological histology of the disease remain to be determined. Three forms of the blotch on the fruit are recognized, fringed, blistered, and pitted types of the disease.

Experiments in control of cankers of pear blight, L. H. DAY (*Phytopathology, 14 (1924), No. 10, pp. 478–480, fig. 1*).—Scarifying canker areas so that all bark is removed from the cankers and for some distance on sound wood and treating the scarred area with a solution of corrosive sublimate and cyanide of mercury in water and glycerine is said to have arrested all cankers so treated. The author states that all epidermal bark must be removed as the fungicide will not penetrate the waxy covering of the bark. If the bark is pared too deeply the cambium may be killed by the treatment.

Experiments with fertilizers and cultivation for the control of bacterial spot of peach, H. W. ANDERSON (*Ill. State Hort. Soc. Trans., 59 (1925), pp. 258–266*).—Results, as detailed with discussion, of an experiment carried out near Ozark, Ill., to test the theory that nitrate fertilizers will control peach bacterial spot (shot hole), led to no definite recommendation. Nitrating, though not dependable to check disease, is considered important in lessening the harmful effect of bacterial spot by adding more leaf surface and by holding the leaves during a longer period.

Control of bacterial spot of peach with sodium silicofluoride, H. W. ANDERSON (*Ill. State Hort. Soc. Trans., 59 (1925), pp. 266–271*).—As a result of laboratory and field experiments it is stated that peach bacterial spot or shot hole (*Bacterium pruni*), the most serious disease in Illinois commercial peach orchards, was controlled almost perfectly during the summer of 1925 by sodium silicofluoride. Though no injury resulted from the application of sodium silicofluoride at concentrations of 1 to 4 lbs. in 50 gal. of water, it is believed that this spray should not be recommended until after another season's trial. This substance is very cheap and plentiful. No injury followed its use as a dust with or without sulfur, even when the trees were sprayed with water following the application. However, owing to high winds and the lack of "fluffiness," the dust did not remain on the foliage and did not successfully control the disease.

Sodium silicofluoride is not only a germicide but also a fungicide and a contact and stomach insecticide.

The manner of infection of peach twigs by the brown rot fungus, G. W. FANT (*Phytopathology, 14 (1924), No. 9, pp. 427–429*).—Inoculation experiments with *Sclerotinia cinerea*, one series made in April and May and the other in midsummer, are said to show that the unwounded peach twig, whether newly formed or of the previous year's growth, is apparently resistant to infections through the epidermis. When twig blighting occurs it is largely confined to infections which enter through blighted blossoms, through attached mummies, or through various sorts of wounds which may appear upon the surface of the peach twig.

Cranberry disease investigations on the Pacific coast, H. F. BAIN (*U. S. Dept. Agr. Bul. 1434 (1926), pp. 29*).—The results are given of four years' study of diseases of cranberries in the Pacific Northwest. Six diseases of the plant and several of the berries in the field are described, and means are suggested for their control. Most of the diseases which occur in the field are said to be of minor importance, the diseases of the fruit in storage being the most de-

structive. Hard rot of the berries, caused by *Sclerotinia oxycocci*, is said to sometimes cause local losses in the field.

Of the storage rots, end rots, caused by *Fusicoccum putrefaciens*, was found to be the most important.

A series of spraying experiments followed by storage tests demonstrated that two applications of Bordeaux mixture, the first just before the blossom stage and the second immediately following blossoming, will control the development of storage rots satisfactorily. Dusting with a lime-copper mixture, in less extensive experiments, failed to give as consistently good control of storage rots as spraying. Cold storage at an average temperature of from 32 to 34° F. failed to prevent the development of rots, particularly over a period of several months.

Diseases of strawberries on the market, D. H. ROSE (*U. S. Dept. Agr., Dept. Circ. 402 (1926), pp. 8, fig. 1*).—The results are given of the study of data furnished by certificates of the food products inspection service of the Bureau of Agricultural Economics covering 5,370 carloads of strawberries examined at terminal markets during the 7-year period ended December 31, 1925. These inspections are said to have covered 5.5 per cent of the total carload movement of strawberries for the 7-year period. Nearly one-third of the inspected cars showed no rot. The average percentage of rot in all carloads inspected was 5.8, while in those which showed rot the percentage was 8.4. Rot caused by the fungus Rhizopus was said to have caused approximately 58 per cent of all the disease found.

Some remarks on questions raised by the Panama disease of bananas, C. G. HANSFORD (*West Indian Agr. Conf., Kingston, Proc., 9 (1924), pp. 41–51*).—A brief account is given of the Panama disease of bananas since its alleged discovery in Jamaica in 1912. Apparently this disease has here, as in large banana areas of Central America, tended to drive, more or less gradually, banana cultivation continually further inland and into the hills. A number of strains of Fusarium isolated from different sources and found to be culturally and morphologically identical with *F. cubense* have shown great differences as regards behavior on inoculation into healthy bananas, when compared with the *F. cubense* isolated from bananas showing the typical Panama disease.

The disease is spread by the planting of suckers bearing incipient stages of the disease, by banana trash, by wind-borne spores, and by the transportation of diseased soil. Attempts at control are discussed.

Researches on Panama disease, S. F. ASHBY (*West Indian Agr. Conf., Kingston, Proc., 9 (1924), pp. 51–53*).—Immunity of bananas to the Panama disease does not exist; but some varieties show resistance, and forms are being tested along with those of known susceptibility, as Giant Fig with Gros Michel.

"This method of soil inoculation, therefore, promises to serve as a rapid means of testing the relative resistance of varieties, a highly susceptible kind being planted as a control."

Red ring disease of the coconut, S. F. ASHBY (*West Indian Agr. Conf., Kingston, Proc., 9 (1924), pp. 164–172*).—"This is a fatal parasitic infectious disease recently recognized as of wide distribution in the West Indian region but known for nearly 20 years under the name of root disease in Trinidad and Tobago. It is present in Honduras, British Honduras, Panama, Venezuela, British Guiana, Trinidad and Tobago, Grenada, and St. Vincent, but has not yet been definitely reported from the Greater Antilles. The evidence sug-

gests spread by means of seed nuts so that it may have been introduced already from Central America into one or more of the Greater Antilles."

Black rot or koleroga of coffee and its control, S. V. VENKATARAYAN (*Mysore Agr. Calendar, 1926, pp. 37, 40, 41, pls. 2*).—The most serious fungus disease of coffee in Mysore on estates of comparatively high elevation is koleroga (black rot), due to *Corticium koleroga*. This disease appears following the heavy rains of the southwest monsoon about the middle of June, spreading from plant to plant until the end of the season, attacking first leaves and twigs, and later berries. The name is due to the mass of black rotting leaves and berries suspended by the mycelial web. Sunshine hinders the development of the fungus. The spores are wind distributed. Several wild hosts grow in or around the coffee estates. Losses vary with rainfall and with lack of sanitation.

The only control method adopted usually on most estates is hand removal of the infected material. Spraying with Bordeaux mixture is effective. The strength found sufficient is that of 2.5 lbs. each of copper sulphate and quicklime to 12 gal. of water. The adhesive ingredient is made up either with resin and soda or casein and lime. The cost of spraying is not heavy if water is readily available. Attempts are being made to secure a reliable dust fungicide.

Fungoid diseases of coffee in Kenya Colony, J. McDONALD (*Kenya Colony Dept. Agr. Bul. 3 [1925?], pp. 17*).—Coffee diseases occurring in Kenya are outlined as those of leaf, berry, stem, and root, as nursery diseases, and as physiological diseases. The two preparations found most effective there are Bordeaux mixture at 2-2-40 and carbide mixture (in which the lime is replaced by calcium carbide).

Die-back of limes (Citrus medica var. acida), E. A. WALTERS (*West Indian Agr. Conf., Kingston, Proc., 9 (1924), pp. 232-234*).—Lime die-back, somewhat common in St. Lucia during recent years, is briefly described. An effort made during 1923 to determine the cause of this trouble shows an almost constant bad soil condition, which is described. A remarkable recovery of trees so affected has been found to result from deeper digging, large applications of humus, and spraying and pruning. It appears that lime trees tend to wilt daily during the prevalence of certain soil and atmospheric conditions which are described. Seedling bed lime plants, and in less degree established trees, appear to be unfavorably affected by the presence of *Casuarina* spp. used as a windbreak. This may be due to a limitation of water supply.

Withertip and blossom blight of limes, S. F. ASHBY (*West Indian Agr. Conf., Kingston, Proc., 9 (1924), pp. 172-176*).—Lime withertip and blossom blight (due to a fungus regarded in Florida as a strain of *Colletotrichum gloeosporioides* but said to have been described by Clausen (E. S. R., 28, p. 749) as *Gloeosporium limetticolum*), present for many years in Florida, Cuba, and probably Porto Rico and said to have been recently reported from the Philippines, became prominent about 1917 in Trinidad (and soon after in British Guiana), but was not known elsewhere in the Lesser Antilles until 1922. A reduction of about 40 per cent in the main crop of 1923 is attributed largely to this disease, which is here described. Tests in Florida have shown that the disease can be controlled measurably by timely spraying of the trees with Bordeaux oil emulsion, or in less degree with lime sulfur. The means regarded as really effective is replacement of susceptible trees with highly resistant or immune varieties, a number of which are now available.

Black rot disease of tea, W. S. SHAW (*Trop. Agr.* [*Ceylon*], *65* (*1925*), *No. 6, pp. 339–343*).—Tea black rot, said to be due to *Corticium invisum* and *C. theae* and to have been first observed in Java in 1907 and in Ceylon (where now also coffee and cacao are attacked) in 1916, is discussed as to its causal fungi, symptoms, dissemination, and treatment.

A disease on Amarantus caused by Choanephora cucurbitarum, B. T. PALM and S. C. J. JOCHEMS (*Phytopathology, 14* (*1924*), *No. 11, pp. 490–494, pl. 1*).—The authors describe a disease of *A. blitum* in Sumatra, the causative agent of the disease being *C. cucurbitarum*. *A. spinosus* was also attacked, as well as a number of other species of plants.

The Phytophthora disease of lilac, H. L. G. DE BRUYN (*Phytopathology, 14* (*1924*), *No. 11, pp. 503–517, figs. 6*).—A description is given of a disease of cultivated lilac due to attacks of *P. syringae*. Leaves, buds, and stems are subject to attack, but the infection is usually brought about only under special conditions. The disease is said to be of economic importance only where lilacs are grown for forcing during the winter months. The usual method of attack is through the leaves to the stem and buds. Picking infected leaves before the fungus has grown down through the petioles is recommended as a means of control.

Tylenchus dipsaci on narcissus, C. E. SCOTT (*Phytopathology, 14* (*1924*), *No. 11, pp. 495–502, pl. 1, figs. 3*).—The occurrence of *T. dipsaci* on narcissus bulbs in the bulb-growing area of California is reported. The author states that characteristic thickened spots occur in the leaves, and that these serve to identify the disease in the field. Of control measures tested, treatments of bulbs in hot water at 110° F. for three hours is said to be the most promising method.

Endothia parasitica, H. M. QUANJER (*Phytopathology, 14* (*1924*), *No. 11, p. 535*).—The reported presence of chestnut canker in Belgium (E. S. R., 56, p. 55) has been investigated by Marchal and Van Hove. The conclusion was reached that the case cited must have been an isolated one, as no trace was found of the disease and it is thought not to have been present in Europe in the fall of 1924.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Proceedings of the International Congress for the Study of Bird Protection, edited by J. MORBACH (*Congrès International pour l'Étude et la Protection des Oiseaux, Luxembourg, 1925. Compt.-Rendu. Luxemburg: P. Worré-Mertens, 1925, pp. 280, pls. 5, figs. 5*).—The proceedings of this congress are reported.

Experiments in the economic control of the western crow (Corvus brachyrhynchos hesperis), L. L. GARDNER (*Auk, 43* (*1926*), *No. 4, pp. 447–461*).—Injury by this crow to almonds and apricots, grown extensively in the Goodnoe Hills, Klickitat Co., Wash., and to considerable acreages of watermelons led to the work by the U. S. D. A. Bureau of Biological Survey here reported.

Damage commenced about the last of July among the apricots and continued through the almond season, or to early in November, by which time practically the entire crop would be destroyed. In a 20-acre almond orchard containing about 1,500 trees some 80,000 crows were observed to congregate. Efforts of the farmers, which included shooting, use of scarecrows, and belling and stringing the trees, had proved unavailing, and poisoning experiments were conducted by the author. Poisoned meat baits proved ineffectual, as the crows' predilection for almonds was too great. The use of poisoned almonds, when properly conducted, proved successful in protecting the crops. While the actual

number of crows poisoned was extremely small, not exceeding 1 per cent of the flock, many orchards were rendered immune from damage, and large melon patches were protected by the same means. Large and choice watermelons, which are the chief agricultural product of the area, were afforded complete immunity from the crows by the use of poisoned melons.

Effects of wheat treated with copper carbonate upon the common house mouse (Mus musculus), W. W. MACKIE and F. N. BRIGGS (*Phytopathology, 16 (1926), No. 9, pp. 629–632, figs. 2*).—In experiments at the California Experiment Station it was found that copper carbonate causes no apparent injury to mice when consumed by them on wheat as ordinarily treated to control bunt. When untreated wheat is available, mice will avoid wheat treated with copper carbonate. So far as the effect upon mice is concerned, copper carbonate is a repellent and not a poison.

Host-parasite specificity among human protozoa, R. W. HEGNER (*Sci. Prog. [London], 21 (1926), No. 82, pp. 249–259*).—It is pointed out that a rather rigid host-parasite specificity exists among human protozoa; certain species are not known to occur in any other host, and others in only one or several animal reservoirs. Species that pass part of their life cycle in an insect host are usually restricted to one principal species or to several species belonging to one genus.

The physics of spray liquids, IV, V, R. M. WOODMAN (*Jour. Pomol. and Hort. Sci., 4 (1925), Nos. 3–4, pp. 184–195; 5 (1925), No. 1, pp. 43–49*).—In the fourth paper of the series (E. S. R., 53, p. 556), entitled The Creaming Capacity of Emulsions—Paraffin Solutions, it is shown, as Pickering demonstrated[1] that so-called emulsions tend to cream to give a clear aqueous underlayer and a cream containing approximately the mathematical limit (74 per cent) of disperse phase. It is argued that this cream is the only true emulsion, and that under ideal conditions it would contain the mathematical limit of disperse phase. Mixtures of this cream or emulsion with excess continuous phase are termed emulsion mixtures.

"The difference between the stability, and the stability to creaming, of an emulsion mixture is pointed out; in the first case lack of stability should be judged to mean the 'cracking' of an emulsion into separate layers of disperse and continuous phases; in the second case (which is often confused with true stability) lack of stability results in creaming to the true emulsion (cracking into disperse phase in mass usually taking place after formation of this cream). The creaming effect is probably one of the chief causes of failure of emulsion mixtures in spraying. The use of wide vessels as containers and the employment of dilute emulsion mixtures accentuate this defect. Equalization of densities of the disperse and continuous phases of an emulsion mixture by adding a substance of greater specific gravity than water, completely miscible with the disperse phase and showing limited miscibility with the continuous phase, gives very stable or lasting emulsion mixtures in the case of paraffin oil. In some cases actual solution of relatively large amounts of oil is obtained. The easiest methods of preparation of these solutions are discussed, and the probable use of the solutions as foliage sprays indicated."

In Part V, Paraffin—Cresols—Soap Solutions: The Detergent Action of Soaps, it is shown that paraffin oil is soluble in cresols-soap solutions to a much greater extent than in soap solutions. The addition of cresols to paraffin oil emulsions in soap media stabilizes the emulsion mixtures to creaming in many cases. Solutions of paraffin oil at all concentrations up to 20 per cent can be made by the aid of soap and cresols.

Cresol, saponified, as a larvicide, C. Strickland and D. N. Roy (*Jour. Roy. Army Med. Corps, 47 (1926), No. 3, pp. 188–195*).—Experiments conducted are presented in detail, and Notes on the Cresols, by A. D. Stewart (pp. 193–195), are included.

Fifty-sixth annual report of the Entomological Society of Ontario, 1925 (*Ent. Soc. Ontario, Ann. Rpt., 56 (1925), pp. 111*).—This report of the proceedings of the annual meeting of the Ontario Entomological Society held at Ottawa in November, 1925, includes the following papers: Report of Insects for the Year 1925, by C. B. Hutchings, A. Cosens, and H. F. Hudson (pp. 7–12); Insects of the Season in Ontario, by L. Caesar and W. A. Ross (pp. 13–17); Notes on the Control of the Grape Berry Moth, by W. A. Ross (pp. 17–19); The Rose Scale in British Columbia, by W. Downes (pp. 19–22); The Oriental Peach Moth in Canada, by A. Gibson (pp. 22–24); Derris as an Insecticide, by A. Kelsall, J. P. Spittall, R. P. Gorham, and G. P. Walker (pp. 24–40); Miscellaneous Notes on Lubricating Oil Sprays with Special Reference to Their Use for Pear Psylla Control, by W. A. Ross (pp. 40–44); The Distribution of Insects and the Significance of Extralimital Data, by E. P. Felt (pp. 44–47); Observations in Quebec in 1925, by G. Maheux (pp. 48–50); Insect Pests Imported on Miscellaneous Plant Products, by R. A. Sheppard (pp. 50–54); Some Insects and Entomologists, by W. E. Britton (pp. 55–63); Controlling the Brown Tail Moth in Nova Scotia, by F. C. Gilliatt (pp. 63–67); The Gypsy Moth Situation in Quebec, by L. S. McLaine and S. H. Short (pp. 67–69); The Birch Leaf Skeletonizer, *Bucculatrix canadensisella* Chamb., by C. B. Hutchings (pp. 69–71); A Preliminary Announcement on the Outbreak of the European Pine Shoot Moth, by L. S. McLaine (pp. 71, 72); Mortality of the European Corn Borer (*Pyrausta nubilalis* Hubn.) Adults and Larvae, by L. Caesar (pp. 72–75); The Spread and Degree of Infestation of the European Corn Borer in 1925, by W. N. Keenan (pp. 75–77); Recent Developments in the Introduction of Parasites of the European Corn Borer in Ontario, by A. B. Baird (p. 78); Egg Studies of the Clover Leaf Curculio, *Sitones hispidulus* Fab., by H. F. Hudson (p. 79); The Striped Cucumber Beetle, *Diabrotica vittata* Fab., by J. Marshall (pp. 80–83); Garden Insects of 1925 in Montreal District, by L. Daviault (pp. 83–85); Parasites of White Grubs in Southern Quebec—A Progress Report, by C. E. Petch and G. H. Hammond (pp. 85–91); Notes on the Life History of the Clover Root Borer, *Hylastinus obscurus*, by H. F. Hudson (pp. 92, 93); and The Entomological Record, 1925, by N. Criddle, C. H. Curran, and H. L. Viereck (pp. 94–107).

The discovery in September, 1925, of the oriental peach moth (*Laspeyresia molesta* Busck) in the peach belt of the Niagara district, Ontario, led to a survey which showed that, if not generally distributed throughout the whole belt, it at least occurs in patches from Hamilton to the Niagara River, and has doubtless been present for several years. Infestation by the European pine shoot moth (*Evetria buoliana*) has been found at six points in Ontario and in Victoria, B. C.

Notes on miscellaneous insects in 1924, B. A. R. Gater (*Malayan Agr. Jour., 13 (1925), No. 6, pp. 160–167*).—This account includes a tabulated list of parasites reared during the year.

Notes on tree and shrub insects in southeastern Pennsylvania, A. B. Wells (*Ent. News, 37 (1926), No. 8, pp. 254–258*).—This is a collection of miscellaneous notes.

[Pests of the coconut palm in the islands of the southern Pacific], H. W. Simmonds (*Fiji Dept. Agr. Bul. 16 (1925), pp. 7–26, pls. 3, figs. 3*).—The more important insects and other pests attacking the coconut palm in the islands of the southern Pacific are considered.

Pineapple insects and some related pests, J. F. Illingworth (*Hawaii. Pineapple Canners' Sta. Bul. 9 (1926), pp. 64, figs. 44*).—In this bulletin the author has brought together accounts of the insects which attack the pineapple and data relating to each where found, hosts, injury, distribution, and control. An annotated bibliography of 179 titles is included.

[Insect enemies of mahogany (Swietenia mahagoni and S. macrophylla) cultivated in Java], L. G. E. Kalshoven (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Inst. Plantenziekten, No. 69 (1926), pp. 27–72, 111–121, pls. 8; Eng. abs., pp. 111–121*).—The insects of mahogany in Java here considered include the mahogany shoot borer (*Hypsipyla robusta* Moore), shot-hole borers of twigs and seedlings (*Xyleborus morigerus* Bldf. and *X. morstatti* Hag.), the red branch borer (*Zeuzera coffæ*), and several of lesser importance.

A further contribution to our knowledge of the bionomics and control of the migratory locust, Schistocerca gregaria Forsk. (peregrina Oliv.), in the Sudan, H. B. Johnston (*Wellcome Trop. Research Labs., Ent. Sect. Bul. 22 (1926), pp. 14, pl. 1*).—This account furnishes information on *S. gregaria* in the Sudan additional to that supplied by King (E. S. R., 47, p. 552).

The locust fungus, Empusa grylli, and its effects on its host, S. H. Skaife (*So. African Jour. Sci., 22 (1925), pp. 298–308, pl. 1*).—Following an historical account, the author discusses climatic conditions, the transmission of the disease, experiments with conidia, the species attacked, development of the fungus, the resting spores, artificial utilization of the disease, and other diseases of the locust. The author finds evidence that there are strains of the fungus which are much more virulent than others, and that it might be found possible to isolate the extremely virulent strains or perhaps even to increase the virulence.

The banana thrips rust, A. A. Girault (*Queensland Agr. Jour., 23 (1925), No. 6, pp. 471–517, figs. 2*).—The author reports at length upon the biology and control of *Anaphothrips signipennis* (Bag.) in the Gympie district. This thrips, originally described from Ceylon in 1914, occurs on the north coast of Queensland and feeds upon the pseudostem and fruit of bananas. The effect of this feeding upon the fruit is a powdery blotching of the skin which, as it increases and ages, turns leathery and becomes more or less cracked—a condition known as banana rust. The insect is present through the seasons, never ceases to reproduce, and all stages occur at one time. Each generation develops in about 34 days, so that in continuity about 10 generations occur during a calendar year, though actually there are less. Treatment, which should not commence until late in the season, consists of regular powderings of the fruit with a bulb blower, using 50 per cent of pyrethrum powder to 50 per cent wood ashes, bulk measurement. Four or more treatments should be made at intervals of not more than 8 or 9 days. Meanwhile all tip fruits should be removed and destroyed. If a spray is desired, Blackleaf 40 in a strong soap solution should be used at double or single strength.

The life history of Tectocoris lineola F. and its connection with internal boll rots in Queensland, E. Ballard and F. G. Holdaway (*Bul. Ent. Research, 16 (1926), No. 4, pp. 329–346, pls. 3, figs. 4*).—The authors give a general account of the life history, bionomics, and distribution of *T. lineola*, together with a description of the adult and some remarks on the influence of weather conditions on mating. Several natural enemies are referred to. The connection between *T. lineola* and boll rot incidence is established. A table illustrates the comparative effect of boll rots and bollworm damage during the season 1924–25 on the Cotton Research Farm at Biloela. The effect of bug punctures

on cotton seed and its infection with *Fusarium moniliforme* are briefly discussed.

The hibiscus mealy bug (Phenacoccus hirsutus Green) in Egypt in 1925 with notes on the introduction of Cryptolaemus montrouzieri Muls., W. J. HALL (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 70 (1926), pp. [3]+15, pls. 5*).—*P. hirsutus*, which has proved a very troublesome pest in Egypt although not of major economic importance, since 1920 has spread from Cairo to nearly all of Egypt in spite of legislation regulating the transport of infected plants and plant produce. Earlier accounts by the author have been noted (E. S. R., 47, pp. 657, 851; 48, p. 552).

Notes on the control of mealybugs, L. R. GARDNER (*Jour. Ent. and Zool., 18 (1926), No. 3, pp. 57, 58*).—A brief discussion.

Miscellaneous observations on a cranberry scale, Targionia dearnessi (Ckll.) (Homop.: Coccidae), D. S. LACROIX (*Ent. News, 37 (1926), No. 8, pp. 249–251*).—In this contribution from the Massachusetts Experiment Station, the author records the infestation of the cranberry at Sandwich, Mass., by *T. dearnessi*. It infested the Early Black, Howe, and Chipman varieties with no apparent preference for any one of the three kinds, and it appeared to be fully as abundant on bogs subjected to regular flowages as on dry bogs. It was also found on bearberry around the edges of cranberry bogs. Notes are presented on its life history, and parasitism by two species of Hymenoptera, *Coccidencyrtus ensifer* (How.) and *Signiphora* sp. (probably new) is recorded.

The San Jose scale in Wisconsin, E. L. CHAMBERS (*Wis. Dept. Agr. Bul. 73 (1926), pp. 8, figs. 3*).—A brief practical account.

The peach borer and the paradichlorobenzene treatment, W. W. MAGILL and A. J. OLNEY (*Ky. Agr. Col. Ext. Circ. 159 (1923), pp. 4, figs. 2; rev. ed. (1926), pp. 6, fig. 1*).—In this brief practical account the authors refer to experiments in 1 and 2-year-old peach orchards in Kentucky and adjoining States which indicate that paradichlorobenzene may be used without injury to the trees. It is stated that a majority of reliable commercial growers in Kentucky are using ⅓ oz. on 1-year-old trees and ⅝ oz. on 2-year-old trees, and have reported complete control of the borer with no injury to several thousand trees tested. As a protection against possible injury to the youngest trees, it is considered advisable to remove the mounds after three weeks, replacing them with fresh earth. Spring treatment with this material has not given satisfactory borer control in Kentucky. In order that paradichlorobenzene may volatilize or make sufficient fumes to kill the borer, the soil temperature should be above 60° F. It is stated that late fall treatment seldom gives satisfactory control.

The damage caused by the sugar cane moth borer in Guadeloupe, C. H. B. WILLIAMS (*Sta. Agron. Guadeloupe, Tech. Bul. 4 (1926), [Eng. ed.], pp. 28, fig. 1*).—This is a preliminary report on an investigation undertaken to determine the importance of the sugar cane borer in connection with the sugar industry of Guadeloupe. The data obtained indicate that a large percentage of the canes is attacked. The percentage of juice extracted and its sucrose content and purity were lowered, but the glucose content of the juice rose as the number of borer holes per stalk increased.

Studies on the spruce budworm (Cacoecia fumiferana Clem.) (*Canada Dept. Agr. Bul. 37, n. ser. (1924), pp. 91, pls. 25, figs. 6*).—This work consists of two parts (1) A General Account of the Outbreaks, Injury, and Associated Insects, by J. M. Swaine and F. C. Craighead (pp. 3–27), and (2) General Bionomics and Possibilities of Prevention and Control, by F. C. Craighead

(pp. 28–88), which includes a chapter on the Abnormalities of Ring Growth and Cell Structure, by I. W. Bailey (pp. 58–61).

The effects of changes on hydrogen-ion concentrations on culicine mosquito larvae, N. F. Paterson (*So. African Jour. Sci., 22 (1925), pp. 311–317*).—The author's study shows that the concentrations most favorable for mosquito development are those giving a reaction similar to that of the water inhabited by the larvae.

"In this case the culicine larvae used in the experiments preferred water having a pH concentration of 7.8, and, although several other concentrations have allowed of the development of adult mosquitoes, it is remarkable that in solutions with pH values of 7.8 or 7.6 the larvae have survived for a greater number of days and more have developed into imagines than in other solutions. The other concentrations must, therefore, have exerted some toxic effect on the mosquito larvae, resulting either in their early death or in inhibition of development. From this it may be inferred that any change in pH concentration of the aquatic breeding place of the mosquito will have some effect on its contained larval mosquitoes.

"Finally, it may be noted that superphosphates and lime are apparently potent larvicides and may be used without injury to water for domestic or irrigation purposes. Copper sulfate and common salt are likewise good destroying agents, but are only efficacious in rather concentrated solutions, and such solutions, especially of copper sulfate, would be highly dangerous. Consequently, as deduced from the results of these preliminary laboratory experiments, the two substances lime and superphosphate are preferable, and, as each is relatively harmless and inexpensive, they may prove a convenient means of aiding in the control of mosquito-borne diseases."

Tabanus rubidus Wied., T. striatus Fab., and Stomoxys calcitrans L. [trans. title], O. Nieschulz (*Dept. Landb., Nijv. en Handel* [*Dutch East Indies*], *Veeartsenijk. Meded., No. 55 (1926), pp. 25, pl. 1*).—A report of studies of these dipterans, which are the more important flies attacking cattle in the Dutch East Indies.

Honey plants of North America (north of Mexico), J. H. Lovell (*Medina, Ohio: A. I. Root Co., 1926, pp. III+408, pl. 1, figs. [128]*).—Part 1 of this work deals with nectar, its secretion, protection, and distribution (pp. 1–35); part 2 with flowers valuable only for pollen (pp. 37–52); part 3 with honey plants of America north of Mexico (pp. 53–245); and part 4 with the honey floras of the different States and the best locations for beekeeping (pp. 247–397).

Report of the Dominion apiarist for the year 1925, C. B. Gooderham (*Canada Expt. Farms, Bee Div. Rpt. 1925, pp. 16, figs. 5*).—This is a brief report of the work of the division during the year, including an account of honey production at Ottawa and the out-apiary at Britannia Heights, bees and pollination, queen breeding, Carniolan v. Italian bees, the age of queen in relation to brood production, wintering 1924–25, etc.

Forty-sixth annual report of the Beekeepers' Association of the Province of Ontario, 1925 (*Ontario Dept. Agr., Beekeepers' Assoc. Ann. Rpt., 46 (1925), pp. 111*).—The papers presented at the annual meeting of this association, held at Toronto in December, 1925, include the following: My System of Manipulating Colonies during the Active Season (pp. 15–36); Package Bees, by T. Shield (pp. 36–47); Diagnosing American and European Foulbrood and Sacbrood in the Apiary, by A. P. Sturtevant (pp. 47–57); Further Experiments in Sterilizing American Foulbrood Combs, by G. L. Jarvis (pp. 57–63); Light Honey Crop Report (pp. 64, 65); The Use of Honey in Food Preparation, by J. Boddick (pp. 67–71); Methods of Spread of American Foulbrood, Methods of Eradica-

tion, by A. P. Sturtevant (pp. 72–75); My System of Preparing Bees for Winter, and Method of Wintering (75–85); Spraying and Dusting Fruit Trees in Full Bloom, by R. B. Wilson (pp. 85–89); Address by E. R. Root (pp. 89–94); and Some Important Beekeeping Problems in New York State, by R. B. Wilson (pp. 95–111).

Bee-keeping in Victoria, F. R. Beuhne (*Melbourne: Victoria Dept. Agr., 1925, rev. and enl. ed., pp. 170, figs. 82*).—A handy guide to beekeeping under Victoria conditions.

A first contribution on the Ichneumonidae of Japan [trans. title], T. Uchida (*Jour. Col. Agr., Hokkaido Imp. Univ., 18 (1926), No. 2, pp. 43–173, pls. 5, figs. 19*).—In this synopsis of the Ichneumonidae of Japan the author lists 241 forms, of which 90 species and 12 varieties are described as new to science, and 7 genera are erected. A list is given of 39 species new to Japan. A bibliography of 65 references to the literature and an index are included.

Some preliminary notes on tea termites, F. P. Jepson (*Trop. Agr. [Ceylon], 67 (1926), No. 2, pp. 67–79, pls. 5*).—An account of termites associated with the tea bush, particularly *Calotermes militaris*, *C. dilatatus*, and *C. greeni*, and their control.

The intestinal flagellates of the termite Cryptotermes hermsi Kirby, H. Kirby, jr. (*Calif. Univ. Pubs. Zool., 29 (1926), No. 4, pp. 103–120, pls. 2, figs. 4*).—Four flagellates are described as new, and the genus Paradevescovina is erected.

Progress report on red spider control, M. A. Yothers (*Idaho State Hort. Assoc. Proc., 24 (1924), pp. 111–116*).—In the author's experiments sulfur dust and the sulfur sprays gave but negligible results in killing the spiders and none whatever in killing the eggs. Lime sulfur at the rates of 1 to 100 and 1 to 50 killed 44 and 52 per cent of the spiders, respectively, but no eggs were destroyed. The Alahambra orchard spray killed 56 per cent of the spiders and 38 per cent of the eggs. Engine oil emulsion was superior to all other materials tested during the season. Used at strengths of from 0.25 to 1 and 2 per cent it killed from 95 to 100 per cent of the spiders and from 61 to 100 per cent of the eggs.

ANIMAL PRODUCTION

Physiological ontogeny: A, Chicken embryos, VIII, IX, H. A. Murray, jr. (*Jour. Gen. Physiol., 9 (1926), No. 5, pp. 603–619, 621–624, pls. 2, figs. 9*).—Two papers continuing this series (E. S. R., 55, p. 860) are noted.

VIII. *Accelerations of integration and differentiation during the embryonic period* (pp. 603–619).—It is shown that the shape of the curve for percentage growth rate is approximated only by the curve for the surface-weight ratio, when the surface is considered as proportional to the two-thirds power of the weight.

The more rapid changes in form occur when the growth rate is rapid, and this was shown to be the case with the form of the embryonic heart. The available data indicate that changes in the chemical form occur after the tenth day of incubation. The percentages of ash and total solids in the whole embryo change mostly during the third quarter and of fat mostly during the fourth quarter of the incubation period. The curve for the percentage of dried solids is intermediate between the ash and fat curves. It thus appears that internal integration and chemical differentiation are more or less synchronous, and that the percentage of dried solids may be taken as an index for both. The water-solids ratio also theoretically represents as significant a function as any.

Data available indicate a general relation between the katabolic rate and the chemical constitution. That the katabolic rate and the latent period are associated with the differentiation of chemical form was indicated from the work with embryos and also with tissue cultures.

IX. *The iodine reaction for the quantitative determination of glutathione in the tissues as a function of age* (pp. 621–624).—Analyses of chick embryos at various stages of incubation for the presence of the sulfhydryl groups, according to the method of Tunnicliffe (E. S. R., 54, p. 9), showed that the percentage of these compounds decreased with age, especially during the third quarter of the incubation period.

Organ weights of normal rabbits, [II], W. H. Brown, L. Pearce, and C. M. Van Allen (*Jour. Expt. Med., 43 (1926), No. 6, pp. 733–741*).—The maximum, minimum, median, and mean weights of various organs of 295 male rabbits are reported, as well as similar data for 350 male rabbits which were given in the first study of this series,[2] and the combined data for the two groups. The standard deviation, the probable error, and the coefficient of variability for the weights of each organ are also given.

Studies on the chemical composition of beef blood, I, II, C. S. Robinson, C. F. Huffman, et al. (*Jour. Biol. Chem., 67 (1926), No. 1, pp. 245–255, 257–266, figs. 4*).—Two papers are given.

I. *The concentrations of certain constituents in normal beef plasma* (pp. 245–255).—In studying the variations in the composition of the blood of normal cattle at the Michigan Experiment Station, 122 samples from approximately 40 animals over one year of age were analyzed for inorganic phosphorus, chlorine, carbon dioxide, and calcium, with some determinations of potassium and magnesium. Various methods of making the calcium determinations were compared.

The average number of milligrams of the different minerals per 100 cc. of blood from mature animals was as follows: Inorganic phosphorus 5.87, chlorine 329, calcium 11.0, carbon dioxide 59.2, potassium 27.3, and magnesium 2.16. The feeding of cod-liver oil and bone meal increased the content of inorganic phosphorus and calcium in the blood of 4 animals, but the values were still within the normal range.

II. *The composition of the blood of dams and calves immediately after calving* (pp. 257–266).—The content of inorganic phosphorus, chlorine, carbon dioxide, and calcium in the blood of 13 cows and their calves was determined on various days during the week following parturition. The determinations were generally within the range for normal cattle, but the inorganic phosphorus in the blood of cows was approximately 0.64 millimols lower than that for the blood of their calves at birth. The content of this element increased during the first week after birth in the blood of both cows and calves.

The chlorine content of the cows' blood was high at calving but dropped steadily during the observation period. Calves' blood showed a low chlorine content after birth but rose slightly and then dropped.

The carbon dioxide content of the blood of both cows and calves was low at parturition, and the values for the mothers were lower than for their calves throughout the first week.

The calcium content of the blood of cows was lower than that of the calves at birth, but increased during the following week, while the calcium in the calves' blood decreased.

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[2] Jour. Expt. Med., 42 (1925), No. 1, pp. 69–82.

Testicular degeneration in albino rats fed a purified food ration, K. E. Mason (*Jour. Expt. Zool., 45 (1926), No. 1, pp. 159–229, figs. 14*).—A complete account of the investigation of which a preliminary report was noted (E. S. R., 54, p. 527).

Dietary factors influencing calcium assimilation.—VI, The antirachitic properties of hays as related to climatic conditions with some observations on the effect of irradiation with ultra-violet light, H. Steenbock, E. B. Hart, C. A. Elvehjem, S. W. F. Kletzien, and B. M. Riising (*Jour. Biol. Chem., 66 (1925), No. 2, pp. 425–440, pl. 1*).—In continuing this series (E. S. R., 53, p. 379), the antirachitic properties of three lots of clover hay cured by different methods were tested in experiments with rats, milking goats, and growing chickens. The three types of hay used were (1) dried in the dark on the floor of an attic with a fan, (2) dried in diffused light in the laboratory and then exposed to the weather and sunlight for 14 days, and (3) allowed to lie in the field exposed to sun, dew, and rain for 14 days.

In the experiments with rats, finely ground samples of the hay were fed at levels of 1 and 5 per cent in a rickets-producing ration. All the lots fed the three different kinds of hays at the 1 per cent level developed rickets, but controls receiving similar amounts of the same hay which had been irradiated for 30 minutes by the rays of a Cooper-Hewitt quartz mercury vapor lamp proved to be normal. At the 5 per cent level the hay irradiated with ultra-violet rays and the sample cured in diffused light and exposed to the weather completely prevented rickets, while that cured in the sun, dew, and rain was partially protective. The sample cured in the attic was inefficient.

The hay cured in the sun, dew, and rain was fed in experiments with three goats. Negative calcium balances were observed when the goats received this hay, but the use of samples of the same hay which had been irradiated for 1 hour changed the calcium balances to positive. In the case of two goats which received hay cut in 0.5- to 1-in. lengths before irradiation it required 3 weeks' feeding to produce positive calcium balances, but when the hay was finely ground before irradiation the negative calcium balances were changed to positive in the second week of such feeding. Direct irradiation for 20 minutes daily of two of the goats receiving the weathered hay brought about positive calcium balances which were larger than those produced when the hay was irradiated.

The experiments with chickens were carried out by adding ether extracts of the three different hays in amounts equivalent to 1 gm. of hay per gram of grain and mineral mixture fed. All lots, including the control lot, showed evidence of leg weakness in 5 weeks. Ash analyses of the tibias indicated uniformly that the ether extracts did not improve the antirachitic properties of the basal ration.

From the results of these experiments it is concluded that the antirachitic properties of hay are increased by a certain amount of exposure to the sunlight, but that too much exposure inactivates this property. Chickens and lactating goats appeared to require far more of the antirachitic substance than rats.

Dietary factors influencing calcium assimilation.—VII, The influence of sunlight upon calcium equilibrium in milking cows, E. B. Hart, H. Steenbock, C. A. Elvehjem, H. Scott, and G. C. Humphrey (*Jour. Biol. Chem., 67 (1926), No. 2, pp. 371–383*).—In continuing this series of studies (see above) an attempt was made to simulate summer pasture conditions, especially in respect to exposure to sunlight and the consumption of green feeds.

During the first half of the experiment, January 1 to May 4, 6 cows were kept continuously indoors, and during the following 6 weeks calci[illegible]

were determined on 3 of the cows, which had freshened in March and were yielding from 45 to 60 lbs. of milk daily. During the last 3 weeks of the balance period the animals were placed in outdoor stalls when the weather permitted, thus receiving a maximum exposure to the sunlight. The average daily ration consisted of approximately 30 lbs. of corn silage and 40 lbs. of lawn clippings, with 1 lb. of a grain mixture for each 3 lbs. of milk produced.

The results showed that the calcium balances were all negative during the indoor feeding period, ranging in general from 100 to 200 gm. of calcium oxide per week. Negative balances prevailed with the exposure to sunlight, but the amount was reduced by 50 to 70 gm. of calcium oxide per week for the different animals.

Because of the unexpected inability of the sunlight to promote more favorable calcium balances the cows were put in an outdoor paddock during the day for the entire summer, during which time the ration consisted of timothy hay, corn silage, grain, and marl. All animals showed a marked decrease in milk production during the summer, which was so great in the case of one cow that she was replaced by another individual which freshened in August. Calcium balances were again determined on these animals for a 28-day period beginning September 14, during which time the cows were moved to the outdoor stalls in suitable weather.

The results showed that the 2 cows which had been continued on the entire experiment were in slight negative calcium balance during the first 2 weeks and in positive calcium balance during the remaining 2 weeks. The cow which freshened in August was in negative calcium balance, amounting to 333 gm. of calcium oxide for the 4 weeks.

The combined results of both experiments showed that it was only possible to maintain a positive calcium balance with normal sunlight and the ration fed when milk production fell below 25 to 30 lbs. per day. It is concluded that summer sunlight is relatively weak in its antirachitic properties as compared with the radiations of a quartz mercury vapor lamp. The advantage of supplying larger amounts of lime to the cows is somewhat questionable.

Potassium in animal nutrition.—III, Influence of potassium on total excretion of sodium, chlorine, calcium, and phosphorus, H. G. MILLER (*Jour. Biol. Chem.*, 67 (1926), No. 1, pp. 71–77).—In continuing this series at the Oregon Experiment Station (E. S. R., 49, p. 568), the effect on the excretion of minerals resulting from supplementing the ration of 2 male rats with a definite amount of potassium acetate, potassium citrate, or potassium chloride was determined. The data, which are presented in tabular form, show that increases in the intake of potassium caused an immediate rise in the excretion of sodium and chlorine, but later that the excretion of these elements was only slightly greater than on the basal ration. In some periods there was a small increase in the excretion of calcium and phosphorus during the high potassium periods.

These studies indicate that the potassium likely to be consumed on normal rations by animals is not a probable cause of an increased excretion of minerals.

The effect of thyroid feeding on the oestrous cycle of the guinea pig and mouse, G. R. CAMERON and A. B. P. AMIES (*Aust. Jour. Expt. Biol. and Med. Sci.*, 3 (1926), No. 1, pp. 37–43, pls. 2, fig. 1).—The results of experiments dealing with the effect of doses of dried thyroid equal to 0.0025 to 0.01 per cent of the body weight on the oestrous cycle of guinea pigs and mice are reported.

Eight parous female guinea pigs and ten virgin female mice were fed the dried thyroid, while four parous and six virgin female guinea pigs and five

virgin female mice served as controls. The guinea pig experiments lasted over a period of 64 to 113 days and the mice experiments for 240 days.

The oestrous cycle of the guinea pigs as determined by vaginal smears averaged 16.5 days with an average duration of oestrum of 1.73 days for the parous females, 15.7 days with an average duration of oestrum of 1.6 days for virgin females, and 16.1 days with an average duration of oestrum of 4.7 days for the females receiving the thyroid. In the control mice the cycle averaged 6.7 days with an average duration of oestrum of 2.4 days, while in the experimental animals the cycle was increased to 12.9 days and the duration of oestrum to 4.2 days. There was a rapid return to normal with the cessation of the thyroid feeding. Thus thyroid feeding in the mouse increased both the duration of oestrum and the length of the cycle, but there was no marked change in the length of the cycle in the guinea pig.

Commercial feeding stuffs, J. L. Hills, C. H. Jones, G. F. Anderson, and E. F. Boyce (*Vermont Sta. Bul. 254 (1926), pp. 56*).—A report listing the brands meeting their guaranties, and the analysis and deficiencies of brands not fulfilling their guaranties (E. S. R., 54, p. 560), from official samples taken during the months of December, 1925, and April, 1926, with discussion.

[Report of the] National Live Stock and Meat Board, [1925–26], R. C. Pollock (*Natl. Livestock and Meat Bd. Rpt., 3 (1926), pp. 80, figs. 64*).—The third annual report of the National Livestock and Meat Board (E. S. R., 54, p. 264) contains brief results of research activities dealing with the cooperative studies of the quality and palatability of meat, meat for blood regeneration, the iron content of meat, meat for the rearing of young, meat grading and branding, and the national study of the retail meat trade.

Studies on the refrigeration of meat.—I, Investigations into the refrigeration of beef, G. A. Cook, E. F. J. Love, J. R. Vickery, and W. J. Young (*Aust. Jour. Expt. Biol. and Med. Sci., 3 (1926), No. 1, pp. 15–31, pls. 3, fig. 1*).—This paper reports the results of an investigation of the possibility of freezing beef in such a manner that no changes occur which are not reversed on thawing. This work was conducted by the committee for the freezing of beef of the Australian National Research Council.

Various temperatures of freezing and thawing were employed, and the latent periods therefore varied. The results of 23 experiments showed that with meat from the same source the amount of drip steadily increased as the duration of the latent period of freezing increased, but there was little uniformity between the different samples in this respect. The calculated loss of nitrogen usually paralleled the amount of drip. The only experiment in which no drip occurred was when the meat was frozen almost instantaneously with liquid aid at −193° C. The amount of drip was materially reduced by increasing the period of thawing. The drip was slightly reduced in 3 of 4 experiments by storing the thawed meat for 7 days at 1°. Further experiments showed that increases in the length of the storage period up to 10 or 11 days at 1° between killing and freezing reduced the amount of drip. There was only a slight increase in the autolysis, even after 20 days' storage.

Study of the histological structure of the samples showed that those frozen with liquid air were practically normal, but that as the length of the freezing period increased the formation of ice crystals was apparent, first within and then between the fibers, accompanied by deterioration and distortion of the tissues.

The curves of autolysis, as determined by the percentage of total nitrogen not precipitated by 10 per cent of tannic acid, were markedly different for frozen and fresh meat. The frozen meat had a lower initial percentage of

soluble nitrogen, but the percentage increased much more rapidly than in fresh meat and considerably exceeded it after 4 days.

The age of the animal killed for beef was found to affect the amount of drip and the amount of distortion when frozen and thawed under uniform conditions. Both the amounts of drip and distortion were least in the youngest animals.

Mutton showed much less ice formation and distortion after freezing than beef when both were frozen under similar conditions.

The development and maintenance of pigs during the suckling period [trans. title], J. Schmidt, E. Lauprecht, and H. Vogel (*Züchtungskunde, 1 (1926), No. 5, pp. 242–256, figs. 4*).—The rate of growth and feed requirements were studied at the University of Göttingen from the records on 6 groups of pigs of different breeding obtained from various sources as follows: 45 litters of White Edelschwein at Ruhlsdorf, 48 litters of Improved Landschwein at Ruhlsdorf, 27 litters of Improved Landschwein at Friedland, 8 litters of Hanovarian-Brunswick Landschwein at Derneburg-Binder, 6 crossbred litters of Berkshire boars × Improved Landschwein sows at Friedland, and 10 crossbred litters of Yorkshire boars × Hanovarian-Brunswick Landschwein sows at Binder.

The weights of the pigs at birth varied with the different groups, depending more especially on the mature weights of the breeds. Male pigs were somewhat heavier in nearly all groups than females. The weights and gains of the pigs at 4 weeks when supplemental feeding was started and at weaning time are given, together with the percentage gains during these intervals.

In the first 4 weeks the different groups increased from approximately 290 to 360 per cent in live weight, and during the first 8 weeks from 660 to 890 per cent. A classification into 2 groups according to the birth weights showed that the pigs with the heavier birth weights made greater total gains to weaning, but the lighter pigs made considerably larger percentage increases over their birth weights. The same condition occurred in the comparison of the sexes.

The sex ratio in 248 litters was 100.7 males to 100 females. The proportion of males was slightly less in litters of more than 12 pigs. Birth weights were found to be affected by litter size. In 163 litters of Improved Landschwein the birth weights of individuals in litters of 9 or more averaged 1.23 kg. (2.7 lbs.) as compared with 1.37 kg. in litters of 8 or less.

The amounts of sow's milk and feed consumed and the gains made per week are tabulated for the Improved Landschwein and the crossbred Berkshire-Landschwein, including the feed necessary to produce a unit of gain up to weaning time. These results show that the crossbred pigs utilized their feed somewhat more economically than the purebreds.

The litter size of Improved Landschwein [trans. title], H. A. Bartram (*Züchtungskunde, 1 (1926), No. 5, pp. 256–269, figs. 3*).—The average sizes of successive litters of sows from the first to the twelfth have been tabulated from herd book records, together with calculations of the standard deviation and probable errors of the mean and standard deviation. The average litter sizes for the first to the twelfth litters consecutively were 8.888±.071, 9.804±.088, 10.498±.115, 11.015±.134, 11.054±.161, 11.436±.202, 11.510±.250, 11.290±.316, 10.618±.355, 11.744±.511, 10.552±.487, and 11.667±.938.

These results, as well as other tabulations for the sows having litters in all groups, show that the sixth and seventh litters were generally the largest. The variability in litter size appeared to increase with age.

[**Poultry investigations at the Dominion experimental farms**], F. C. ELFORD (*Canada Expt. Farms, Poultry Div. Rpt. 1925, pp. 67, figs. 19*).—This is the usual report of the Dominion poultry husbandman (E. S. R., 54, p. 667), giving the results of investigations in progress.

Duration and change of fertility.—In continuing the study of the length of time hens produced fertile eggs after removing the male, Barred Rock females were first mated with a Barred Rock male and later with a White Leghorn male. The results showed that the effect of the Leghorn mating was apparent in the case of one fowl on the fourth day after mating, but the effects of the Barred Rock mating did not cease in one hen until after the twelfth day.

Vigor and breeding power of registered hens.—Data are presented showing that high producing birds may lay eggs that are fertile, hatch well, and produce vigorous chicks.

Crossbreeding.—In crossing experiments with Barred Plymouth Rock ♂ × Single Comb White Leghorn ♀, Single Comb White Leghorn ♂ × White Wyandotte ♀ and Barred Plymouth Rock ♀, and Rhode Island Red ♂ × Single Comb White Leghorn ♀, it has been found that the eggs laid by the birds of the F_1 generation were brown in all cases, indicating that brown egg-color was dominant over white. In this experiment the relation of external characteristics of the chicks to sex has also been noted. In the cross of Rhode Island Red males with Single Comb White Leghorn females all the female chicks were spotted with black and 80 per cent of the males were white. In the cross of the Barred Plymouth Rock male with the Rhode Island Red female, or the Single Comb White Leghorn male with the Rhode Island Red female, there were no indications of sex differences at hatching.

The effects of feeding bone meal upon fertility, hatchability, and viability.—Twenty pens containing 236 hens in all were used for comparing the fertility, hatchability, and viability of chicks produced when 5 per cent of bone meal was added to a standard ration. The results showed that of the eggs produced by the birds receiving no bone meal 82.1 per cent were fertile, 64.9 per cent of which hatched. The eggs from those receiving bone meal were 83.6 fertile, of which 61.1 per cent hatched. The chick mortalities to 3 weeks of age were 24.9 and 27.1 per cent, respectively.

Starvation period for chicks.—Very indefinite results were obtained in an experiment in which chicks given their first feed at the time of removing from the incubator were compared with other lots receiving their first meal 24, 36, and 48 hours later.

Vitamin feeds and rations for brooder-chicks.—Fourteen lots of 50 chicks each were selected for comparing the effect of various feeds during the first 3 weeks of growth. The basal ration, consisting of a commercial scratch-grain mixture and a mash of equal parts of shorts, middlings, corn meal, and oat flour with one-half part of meat meal and 0.5 per cent of salt, fed with grit, green feed, and milk and water, gave better results than the rations from which the oat flour was omitted or to which corn meal and middlings or semi-solid buttermilk were added, or in which meat meal was given in place of the milk. The addition of refined cod-liver oil to the basal ration produced the best percentage increase in weight of all lots, followed in order as far as the gains were concerned by the rations containing Larro and Fleischmann's yeast, the basal ration, and Fleischmann's yeast and crude cod-liver oil. The amount of mortality ranked in inverse order to the gains. Mortality was 18 per cent in one lot receiving pork liver in place of the meat meal in the mash. The combined 2 years' results of similar experiments are tabulated.

Methods of feeding brooder-chicks.—A comparison of the advisability of leaving dry-mash hoppers open at all times as compared with making them available six times a day for brooder-chicks is reported. The results showed that those having access to the mash at all times made the largest gains, but the highest mortality also occurred among such chicks. A lot receiving crude cod-liver oil made the poorest gains of all lots.

The effect of sunlight upon growing chicks.—Nine lots of chicks were selected for studying the effect of exposure to sunlight and supplementing the ration with crude and refined cod-liver oil. The birds not being exposed to sunlight were in pens having the windows covered with heavy brown paper and light was supplied by electricity. The results showed that the highest mortality occurred in the pens having no sunlight, while the mortality was lowest in those having direct access to sunlight. The former group, however, made the greatest percentage gains in weight.

Buttermilk v. no buttermilk for growing chicks.—During a 9 weeks' test chicks receiving both buttermilk and water as drink made average increases in weight of 142 per cent over those receiving no milk, and the mortality was more than twice as heavy in the latter group.

Vitamin feeds and rations for rearing.—The value of various supplements to a basal ration for rearing was studied with seven pens of 3-weeks-old chicks during a 10 weeks' test. During the first 7 weeks the highest percentage gains were made by those receiving raw liver, followed in order by those receiving Larro yeast and crude cod-liver oil. The highest mortality occurred in the check lot, and the next highest mortality was in the pen receiving raw liver. The raw liver pen was superior during the entire experiment from the standpoint of gains. The results of 2 years' work feeding these supplements are tabulated.

Feed costs in brooding and rearing chicks to ten weeks of age.—Estimates of the cost of brooding and rearing Barred Rock and White Leghorn chicks indicated that the feed costs were similar for both breeds, but since the Barred Rocks made more rapid gains the cost per unit of gain was less.

The effects of feeding cod-liver oil upon the weight and texture of eggshell.—In an experiment in which one lot of birds received 4 cc. of cod-liver oil daily, no appreciable effect was noted in increasing either the gross egg weight or the weight of the shell.

The effects of a commercial stimulant and of bone meal on spring egg production.—During a 55-day test of a commercial stimulant known as "Egg Maker" and bone meal, fed as supplements to a basal ration, the birds receiving the "Egg Maker," both with and without bone meal, produced 3.46 more eggs per bird than those receiving the standard ration without the supplement. In the following 53-day period there was a difference of 0.9 per cent between these two lots in egg production. The birds receiving bone meal produced 0.89 more eggs per bird during the feeding period than those receiving no bone meal, and the decrease during the succeeding 53-day period without bone meal was 4.4 less than occurred in the birds in the check lot.

Feeding experiments for winter egg prdouction.—In a 6 months' test 15 pens of White Leghorn pullets were selected for comparing semisolid buttermilk with fresh buttermilk when fed with and without mash, home-mixed mash with commercial mash, various green feeds with Epsom salts, and crude and refined cod-liver oil with Fleischmann's and Larro yeast for their effect on the production and hatching qualities of the eggs. The birds receiving the fresh buttermilk without mash produced eggs at the lowest cost per dozen in that test, being followed in order by those receiving fresh buttermilk and mash, semisolid buttermilk without mash, and semisolid buttermilk with mash.

The heaviest mortality occurred in the first group. In the comparison of green feeds the best egg production and largest profits occurred in the lot receiving the clover leaves, but the best hatching results occurred in the lot receiving the Epsom salts. Higher production occurred with the commercial mash, but the additional cost made the home-mixed mash more profitable. Studies of the vitamin feeds for egg production showed that the control pen produced eggs at the lowest cost per dozen, while the cod-liver oil somewhat increased the hatching results.

Egg-storage experiments.—A study of the "Guaranise" process for storing eggs showed that processed eggs after 6 months' storage were markedly superior to the unprocessed eggs. It is concluded from 3 years' experiments that this method of processing eggs is to be recommended. Better results in storing eggs in an ordinary cellar were also obtained with those which had been treated according to this process.

Duck-feeding experiments.—A study of the rate of growth of ducklings of four breeds, Pekins, Rouens, White Muscovies, and colored Muscovies is reported. The Pekins made the most rapid and most economical gains per unit of feed consumed, and consequently the largest profit over feed costs.

A comparison of different forms of milk in a ration for growing chickens, L. E. Card (*Poultry Sci., 5 (1926), No. 4, pp. 199–202, fig. 1*).—Sour skim milk, buttermilk, condensed buttermilk (fed as paste), and dried buttermilk (25 per cent of the mash) were fed as supplements to a basal ration to 4 different lots of 200 Barred Plymouth Rock chicks each at the Illinois Experiment Station. The cockerels were separated at 10 weeks of age, and the pullets were fed to 22 weeks.

There were significant differences between the average weights of the individual groups at certain times, but at the conclusion of the experiment the maximum difference between groups was only 2.3 per cent of the live weight, which is insignificant. The lot receiving dried buttermilk made slightly more regular growth than the others, and variations in the milk consumption were not so great as with the liquid milk products. The mortality was high in all lots, due largely to an outbreak of bacillary white diarrhea. It is concluded that the nutritive values of these milk products are similar.

Standard breeds and varieties of chickens.—I, American, Asiatic, English, and Mediterranean classes, M. A. Jull (*U. S. Dept. Agr., Farmers' Bul. 1506 (1926), pp. II+37, figs. 33*).—This bulletin supersedes Farmers' Bulletins 898 (E. S. R., 38, p. 373); 1052 (E. S. R., 41. p. 676); and 1347 (E. S. R., 50, p. 72).

A case of the normal development of geese twins within one egg [trans. title], J. Křižkenecký (*Züchtungskunde, 1 (1926), No. 5, pp. 233–241, figs. 3*).—The author describes a case of a male and a female embryo which developed to near maturity in one double-yolked goose egg. The twins died from a lack of oxygen.

DAIRY FARMING—DAIRYING

The energy requirements of dairy cows.—II, Is net energy or metabolizable energy the more useful index for practical purposes? E. B. Meigs (*Jour. Dairy Sci., 8 (1925), No. 6, pp. 523–536*).—In continuing this series (E. S. R., 54, p. 66) the author discusses primarily net energy and metabolizable energy as a means of measuring the energy requirements of dairy cows. It is pointed out that the net energy value of food is that fraction of its metabolizable energy which an animal may use for maintenance or fattening and is subject to variation due to differences in the external temperature and the muscular

activity of the animal. It is therefore considered that net energy values obtained in the calorimeter would probably be more or less inapplicable to practical conditions, while total digestible nutrients and probably metabolizable energy are better and more constant measures of the relative values of feeds under practical conditions.

Energy requirements of dairy cows.—A reply to articles by E. B. Meigs and H. T. Converse, E. B. FORBES (*Jour. Dairy Sci., 9 (1926), No. 4, pp. 373-378*).—A criticism of papers previously noted by Meigs and Converse (E. S. R., 54, p. 66), and by Meigs (noted above).

Investigations of the tethering of dairy cows on vetch and oats [trans. title], W. P. USTJANZEFF, I. I. GRIGORENKO, and N. S. PEREKREST (*Milchw. Forsch. 3 (1926), No. 1, pp. 97-116*).—Two lots of four cows each were selected for studying the influence of tethering on milk production. Both lots were stall-fed during the first and third periods of the experiment, but during the second period one lot was tethered on vetch, while the other lot received green vetch and oats in the stable. The test showed that during the period of feeding the green feeds the tethered lot increased their production an average of 25 per cent, while the stable-fed lot increased their production 12 per cent. Both groups also increased in live weight when receiving green feed, which was particularly pronounced in the tethered lot. The Reichert-Meissl and the iodine numbers of the butter showed only slight variations during the period of tethering as compared with dry feeding, but the time required for reduction to occur in the methylene blue test in the milk was somewhat shortened in certain cases. Such a condition was not observed during the stall feeding of the green plants. From the standpoint of the economical utilization of feed, stall feeding appeared to be slightly superior.

Silage feeding experiments, A. W. OLDERSHAW (*Jour. Roy. Agr. Soc. England, 86 (1925), pp. 112-128*).—The results of two experiments are reported in which the milk production of lots of cows fed on rations containing mangels was compared with the milk production of other cows receiving rations containing similar amounts of starch equivalent and protein, but in which the succulent roughage was derived mainly from silage. Milk production was slightly better with the root rations in both experiments, but was practically equal for the cows which ate the silage readily. Certain individual cows would not eat the silage.

Investigations with the fermentation of beet tops and their feeding value for milch cows [trans. title], W. P. USTJANZEFF and I. I. GRIGORENKO (*Milchw. Forsch., 3 (1926), No. 1, pp. 83-96*).—In a test of the feeding value of beet top silage, 3 cows were fed during the first and third periods on a ration of hay, chopped wheat, and linseed oil cake. In the second period beet top silage replaced the chopped wheat on an equivalent starch value basis. Calculations of the normal milk production during period 2 from the production on the basal ration during periods 1 and 3 showed that there was a decrease of from 2.7 to 10.7 per cent in the production of the individual animals when beet top silage was fed.

Determinations of the digestibility of the beet top silage in two experiments with two wethers each showed wide variations in the results. Linseed oil cake and hay were fed in addition to the silage in one of the digestion experiments, while hay was the only additional feed in the other. Inaccuracy in the estimation of the digestibility of the hay or linseed oil cake may account for the variations in the results, but it is also mentioned that the tests were made with beet tops from different parts of the silo. The estimated starch value on

the basis of these experiments was lower than that given by Kellner and from that used in the calculations for the experiments with the dairy cows.

The influence of gluten feed on the milk production of cows.—A feeding experiment with 20 cows [trans. title], H. BÜNGER and H. LAMPRECHT (*Milchw. Forsch., 3 (1926), No. 1, pp. 69–82, fig. 1*).—In studying the value of gluten feed for milk production, 2 lots of 10 cows each were fed during three periods of approximately 4 weeks' duration. One lot was fed throughout and the other lot during the first and third periods on an average daily ration of 2.5 kg. of clover hay, 3 kg. of oat straw, 3 kg. of barley straw, 6 kg. of vetch silage, 15 kg. of fodder beets, and 3 kg. of a grain mixture composed of equal parts of coconut cake, ground beans, and vetch seed. Two-thirds of the grain mixture was replaced by an equal amonnt of gluten feed in the second period for the one lot.

The data on milk and fat production are recorded for 21 days in the first period and for the last 21 and 19 days, respectively, of the second and third periods. The group receiving the basal ration throughout produced an average of 7.55, 7.02, and 6.80 kg. of milk per head daily in the first, second, and third periods, respectively. The substitution of gluten feed for two-thirds of the grain mixture tended to increase the production of the second group, as the average for the three periods were 8.14, 8.18, and 7.55 kg., respectively, per head daily. The fat perecentage of the milk showed only small variations, and the amount of fat was, therefore, in general, proportional to the amount of milk. The same conclusions for milk and fat production followed when the normal production on the basal ration was estimated for the second period by interpolation, based on the production during the first and third periods. No abnormal flavors were detected in the milk as a result of the gluten feeding.

The efficiency of cacao meal with the fat removed for the feeding of milch cows.—A feeding experiment with 24 animals [trans. title], H. BÜNGER and H. LAMPRECHT (*Milchw. Forsch., 3 (1926), No. 1, pp. 3–20, figs. 2*).—In testing the palatability of cacao meal and comparing it with coconut meal for milk production, 4 lots of 6 animals each were fed on a basal ration of hay, oat straw, and a grain mixture of ground oats, barley, wheat, and peas during a 23-day feeding period. In the following 29 days the basal ration was supplemented with 0.87 or 0.78 kg. of cacao meal or coconut meal in four different lots. During the following 25 days the basal ration was again fed. In general the cacao meal was relatively unpalatable, due to its fine powdery form and the presence of a fish meal flavor.

The results of milk production after eliminating the first 6 or 7 days after the rations were changed showed that both groups of cows receiving the cacao meal produced materially less milk than when on the basal ration, while the coconut meal stimulated milk production. Both the supplements increased the fat content of the milk, but the increase was considerably greater with cacao meal. The flavor of both the butter and the milk were unfavorably influenced by this feed. The possible effect of 2.68 per cent of theobromine in the cacao meal is discussed from the standpoint of palatability of the meal and the flavor of the milk and butter.

Contribution to the vitamin A content of butter under the influence of common feeds [trans. title], A. SCHEUNERT (*Milchw. Forsch., 3 (1926), No. 1, pp. 117–121, figs. 3*).—Using rats, the author has compared the amounts of vitamin A in butter from cows receiving rations containing fodder beets with other grains, corn silage with similar grains, and pasture only. In making the tests, vitamin A-deficient rations were supplemented with 0.1, 0.25, and 0.5 gm. of butterfat from the different sources. The results show that the

butter from the cows receiving beets was lowest in its vitamin A content, as 0.5 gm. daily was not sufficient to allow normal growth in the rat after 58 days. The butter from the pasture-fed cows was the richest source of vitamin A, as normal growth was maintained with 0.25 gm. of butter, while 0.5 gm. of butter from the silage-fed cows was necessary for normal growth.

Relative rates of secretion of various milk constituents, W. L. Gaines (*Jour. Dairy Sci., 8 (1925), No. 6, pp. 486–496, figs. 3*).—From a statistical study of the chemical analyses of weekly milk samples from 543 individual cows of several breeds published in Minnesota Experiment Station Bulletin 140 (E. S. R., 31, p. 670), the rates of secretion of fat and protein appear to be intimately related, the correlation coefficient being 0.812±0.010. The relation between fat and protein was found to follow a straight line in various species having fat percentages running as low as 0.36 per cent (ass) and as high as 22.46 per cent (reindeer). High negative correlations between the water and fat and water and protein are shown to indicate that these constituents are largely independent. Statistical constants and regression equations are also presented.

Milk production with special reference to some typical secretion anomalies and their practical importance [trans. title], G. Koestler, W. Lehmann, W. Lörtscher, and E. Elser (*Landw. Jahrb. Schweiz, 40 (1926), No. 3, pp. 287–440*).—The first part of this publication gives a brief review of the physiological factors related to the production of normal milk and colostrum. The second part gives the results of studies of the quantity and quality of the milk produced by the different quarters of cows' udders under normal conditions, and studies of the various physicochemical and bacteriological properties of abnormal milk drawn from the different quarters of the udder and at different stages during milking.

Udder cocci (mammococcus) [trans. title], C. Gorini (*Milchw. Forsch., 3 (1926), No. 2–3, pp. 178–183*).—Studies of the morphological and physiological characteristics of more than 50 strains of cocci, isolated from aseptically drawn milk, have indicated that much variability exists in these types, which allows them to be differentiated into different groups and intermediate groups.

The effect of these organisms on the milk is uncertain. They may cause abnormal fermentation or in severe cases mastitis, but when the amounts present are small there is no apparent effect.

The biology of Bacterium casei ε (v. Freudenreich) and Mycoderma thöni [trans. title], W. A. Lott (*Milchw. Forsch., 3 (1926), No. 2–3, pp. 272–284*).—The results of this study have shown that these two organisms make much better growth, especially in whey, when the two are present together, indicating a symbiotic relation. Certain differences in their physiological characteristics are pointed out.

Critical and experimental studies of pasteurization of milk, H. Brand (*Kritische und Experimentelle Studien zur Pasteurisierung der Milch. Thesis, Eidg. Tech. Hochsch., Zurich, 1925, pp. 91, figs. 6*).—The first part of this publication deals with the purpose of pasteurization, the resulting changes in the milk, and methods and regulations for pasteurization in force in Europe and America. The second portion of the work deals with the efficiency of pasteurization for destroying bacteria and prolonging the keeping qualities of cow's and human milk. The results of these studies showed that pasteurization at 63° C. (145.4° F.) for 30 minutes killed all the pathogenic organisms but did not materially affect the keeping qualities. The findings were similar when human milk was pasteurized.

Investigation of current relations in agitator flash pasteurizers and their influence on the death of organisms [trans. title], K. RICHTER and H. M. WENDT (*Milchw. Forsch., 3 (1926), No. 2-3, pp. 200-205, figs. 6*).—The amount of direct flow through two types of flash pasteurizers was determined by first sending skim milk and then whole milk through the pasteurizers. The length of time that different portions remained in the container was estimated from the fat content of the milk coming out.

The results showed that in one type of pasteurizer, which was cylindrical in shape, portions of the milk passed through in a few seconds, while other portions remained for as long as 4 minutes. The top of the other type of pasteurizer was larger in diameter than the bottom. The maximum and minimum time required for milk to go through this type was 70 and 15 seconds, respectively. In the latter type the destruction of *Bacillus coli* was very complete.

Contribution from the testing offices for dairy equipment in the Prussian Institute for Investigation and Research in Dairying at Kiel [trans. title], [K.] RICHTER ET AL. (*Milchw. Forsch., 3 (1926), No. 2-3, pp. 185-199, figs. 4*).—An apparatus for holding milk at a uniform temperature and at the same time allowing a slow flow through it was tested as to its efficiency. It was found that milk heated to pasteurizing temperature lost some heat during its passage through the apparatus, and though the average time was 30 minutes, certain of the milk passed through considerably quicker while other portions of the milk were held for longer periods. The efficiency of the pasteurization, as judged by the numbers of organisms killed, was only 44.24 per cent in one test.

Keeping quality of sweet cream butter as affected by temperature of pasteurization of the cream, W. WHITE and G. R. CAMPBELL (*Jour. Dairy Sci., 8 (1925), No. 6, pp. 497-499*).—The results of studies at the Bureau of Dairying, U. S. D. A., of the effect of various pasteurization temperatures from 145 to 165° F. for from 25 to 30 minutes on the keeping qualities of sweet cream butter stored at 0° for from 7.5 to 9 months indicated that the keeping qualities of such butter were not influenced by the pasteurization temperature.

Some factors concerning the "partial neutralization" of cream for buttermaking, B. A. STIRITZ and H. A. REUHE (*Jour. Dairy Sci., 8 (1925), No. 6, pp. 459-485*).—This is a more complete account of work previously noted from the Illinois Experiment Station (E. S. R., 52, p. 479). The work deals with the comparative effects of slaked lime, Lehigh lime, soda ash, and sodium bicarbonate as to the time required for neutralization, the reduction of acidity during pasteurization, the time required for churning, the completeness of churning, and the quality of the butter produced.

The effect of homogenization, condensation, and variations in the fat content of a milk upon the keeping quality of its milk powder, G. E. HOLM, G. R. GREENBANK, and E. F. DEYSHER (*Jour. Dairy Sci., 8 (1925), No. 6, pp. 515-522, figs. 3*).—The keeping quality of milk powdered by the spray process and sealed in tin cans was compared at the Bureau of Dairying, U. S. D. A., when made from milk varying in fat content and which had been differently treated during manufacture. The results showed that precondensation and homogenization tended to improve the keeping qualities, but larger amounts of fat were not as favorable as smaller amounts. The ability to withstand oxygen absorption was directly measured as an indication of the keeping quality in part of the experiments.

VETERINARY MEDICINE

The spermatogenesis of domestic mammals, III, K. MASUI (*Jour. Col. Agr., Imp. Univ. Tokyo, 8 (1923), No. 2, pp. 207–252, pls. 7, fig. 1*).—This third paper (E. S. R., 43, p. 670) deals with the spermatogenesis of the mouse and of the rabbit. A list of 61 references to the literature is included.

A hitherto undescribed anomaly in blood groups, R. OTTENBERG and A. JOHNSON (*Jour. Immunol., 12 (1926), No. 1, pp. 35–44*).—This is a report upon an anomaly in the blood of a professional donor, which contained an abnormal agglutinin and behaved practically like the blood of a foreign species of animal.

The sensitization of pigeons to foreign proteins, J. E. GAHRINGER (*Jour. Immunol., 12 (1926), No. 6, pp. 477–488*).—The author demonstrated by the use of dog's serum that the pigeon is readily sensitized to a foreign protein.

"When the most favorable sensitizing and critical doses are used, a demonstrable induced sensitiveness occurs on the fourth day, increases rapidly to the tenth day, and reaches a maximum by the twentieth day. It then decreases gradually, to disappear between the sixtieth and seventieth days. When single or multiple shock reactions are induced in the pigeon, each and every reaction is followed by a definite period of insensitiveness. The primary change in blood coagulability during anaphylactic shock is an increase in coagulability, to which a decrease in coagulability is always secondary."

Prophylactic and therapeutic possibilities of the Twort-d'Herelle's bacteriophage, L. ARNOLD and E. WEISS (*Jour. Lab. and Clin. Med., 12 (1926), No. 1, pp. 20–31*).—The authors' investigations here reported have led to the conclusion that the lysed, soluble bacterial proteins in the bacteriophage are antigenic and confer an early active immunity. Bacteriophage, free of antigenic bacterial proteins, prevents death when injected in the rabbit after a lethal dose of bacteria has been given. A list of 25 references to the literature is included.

A method for the preliminary identification of the common tissue-invading anaerobes, J. P. SCOTT (*Cornell Vet., 16 (1926), No. 1, pp. 55–58*).—This is a contribution from the Kansas Experiment Station in which a simplified technique is described by means of which a preliminary identification of tissue-invading anaerobes may be made. Differentiation is based upon the type of growth made in six different media, including the brain-liver and liver agar used in isolation. Six media are described by the type of growth in which a preliminary identification of *Clostridium chauvoei*, *C. edematis*, *C. sporogenes*, *C. welchii*, and *C. novyi* can be made.

Bacterial variation: Serological characters of parent and sub-strains within the para B-suipestifer group, P. R. EDWARDS and L. F. RETTGER (*Jour. Immunol., 12 (1926), No. 5, pp. 377–392*).—The authors conclude that there are two antigens present in the Salmonella group, one of which is specific to types within the group. The other relates the type with the group, and it is due to this that marked cross reactions between the different types occur.

"The two types of bacilli may be separated by plating stock cultures. When maintained under ordinary laboratory conditions the two types tend to resume the characters of the parent strains. The time required for this change to take place varies from a few days to several months. When subjected to unfavorable conditions strains may temporarily lose the ability to absorb agglutinins to which they have previously given rise. Strains may for a time lose their ability to agglutinate with group antisera. It appears that the two antigens present in the para B-suipestifer group are rather complex, and may at times be strain specific rather than type specific or group specific."

An experimental study of tick paralysis in Australia, I. C. Ross (*Parasitology, 18 (1926), No. 4, pp. 410–429, figs. 2*).—In this contribution from the veterinary science department of the University of Sydney the author reports that tick paralysis occurs in man and in the dog and other domesticated animals on the east coast of Australia. As far as is known, the disease in Australia is conveyed only by the mature female of *Ixodes holocyclus*. There is said to be some evidence that immunity to the disease may be acquired after recovery from previous attacks.

Immunological studies in tuberculosis, III, IV, S. A. Petroff and F. W. Stewart (*Jour. Immunol., 10 (1925), No. 4, pp. 677–717, figs. 40; 12 (1926), No. 2, pp. 97–121*).—This is a continuation of the studies previously noted (E. S. R., 50, p. 80; 53, p. 583).

In Part III an account is given of an attempt to repeat with animals sensitized by dead tubercle bacilli the various allergic phenomena which in the past have been observed only in animals previously infected with living tubercle bacilli. In studying these allergic reactions two types of controls were used, one of tuberculous and the other of perfectly healthy animals. While much more work must be done before definite conclusions can be drawn, the authors find that animals sensitized with dead tubercle bacilli give an allergic reaction which in its essentials does not vary from that observed in infected animals, and that the severity of the reaction depends upon the degree of hypersensitiveness.

In the fourth paper of the series, five series of experiments with guinea pigs sensitized with dead tubercle bacilli are reported, in which tuberculin hypersensitiveness was induced with dead tubercle bacilli. During the allergic state inoculations of living tubercle bacilli were made, with the use of approximately the same number of normal control animals. The sensitized animals outlived the controls an average of 46 days, and the amount of macroscopic disease at autopsy in the former was much less extensive than in the latter, confirming the belief that dead tubercle bacilli can induce some degree of protection. In a small series, guinea pigs were sensitized with Dreyer's defatted tubercle bacilli. Only a mild skin hypersensitiveness was produced, and that not uniformly. No appreciable resistance could be observed in these animals.

Researches concerning avian tuberculosis in cattle; occurrence of avian as well as bovine tubercle bacilli in the same cow, N. Plum (*Cornell Vet., 16 (1926), No. 4, pp. 250–255*).—This is a contribution from the Veterinary Serum Laboratory at Copenhagen, Denmark, in which work with avian tuberculosis in cattle is briefly considered.

Tuberculous abortion disease in cattle, N. Plum (*Cornell Vet., 16 (1926), No. 4, pp. 237–249*).—This is a contribution from the Veterinary Serum Laboratory at Copenhagen, Denmark. The discussion includes a detailed report of six cases. In examination of a series of 834 consecutive fetal membranes, tuberculous abortion was found in 1.79 per cent.

The value of placental examination for the diagnosis of infectious abortion of cattle, W. A. Hagan (*Cornell Vet., 16 (1926), No. 4, pp. 274–279, figs. 2*).—It is pointed out that gross lesions of characteristic appearance are produced in the placenta through the action of *Brucella abortus* (Bang). These represent the only gross lesions due to this organism which may be recognised positively in the bovine species. The lesions are located in the chorion and are particularly characteristic in the portions of this membrane which lie between the cotyledons. The lesions may be widespread or may occur only in a circumscribed area. When abortion is due to *B. abortus*, it is believed that these lesions are always present and may be recognized in the majority of cases. In the present instance, a correct diagnosis was made in 29 cases in a series of 82 abortions.

A study of the value of whole milk and milk sediment for the isolation of Bacterium abortus Bang, C. P. FITCH and R. E. LUBBEHUSEN (*Cornell Vet., 16 (1926), No. 1, pp. 46–54*).—This is a report of investigations conducted at the Minnesota Experiment Station. In summarizing the work, the authors point out that milk used for injection should be representative of a composite sample of an entire milking, and that both whole milk and milk sediment are of value in the isolation of *B. abortus* but neither should be used to the exclusion of the other. *B. abortus* was isolated from whole milk in 29.7 per cent and from milk sediment in 43.2 per cent of the samples showing evidence of infection. If either method is used, the injection of milk sediment is to be preferred as being most efficient.

Some recent advances in the protection of cattle and other animals against disease.—VIII, Haemorrhagic septicaemia in cattle in India, S. C. J. BENNETT (*Agr. Jour India, 21 (1926), No. 5, pp. 351–356*).—A brief discussion of the present knowledge of this disease including its prevention and control.

The blood and urine of the cow in milk fever.—A second report, C. E. HAYDEN (*Cornell Vet., 15 (1925), No. 4, pp. 399–404*).—The author finds that there is hyperglycemia and glycosuria in milk fever, the hyperglycemia commencing to decrease with udder inflation and accompanying treatment. The hyperglycemia may be a reflex of the extreme nervous reaction evident before treatment. Nonprotein nitrogen and urea are both above normal. The average increase indicates a slight renal impairment. Uric acid in the blood is not increased in the same proportion as it is in eclampsia, and while there is a very slight increase it is not enough to indicate renal disturbance.

Pyocyaneus bacillosis and mastitis due to Ps. aeruginosa, E. M. PICKENS, M. F. WELSH, and L. J. POELMA (*Cornell Vet., 16 (1926), No. 3, pp. 186–202*).—The authors find in work at the Maryland Experiment Station that under proper conditions *Pseudomonas aeruginosa* seems to be capable of producing mastitis in cattle. A case of infection with *P. aeruginosa* in a calf here described is believed to be identical with the so-called "pyocyaneus bacillosis" of Poels. It is pointed out that when cultivated upon artificial media this organism may lose its pathogenicity for experimental animals within a few weeks. Autogenic bacterins were found to be of questionable value in the treatment of mastitis in cattle due to *P. aeruginosa*. The blood of cattle suffering, or having recently suffered, from infection from *P. aeruginosa* may agglutinate homologous antigens in dilutions as high as 1:1,000. The blood of cattle not suffering, or not having recently suffered, from infection with the organism may agglutinate homologous antigens in dilutions as high as 1:50.

The account includes a list of 34 references to the literature.

Studies in dog-distemper, G. W. DUNKIN and P. P. LAIDLAW (*Jour. Compar. Path. and Ther., 39 (1926), No. 3, pp. 201–230, figs. 4*).—The several parts of these studies deal with (1) dog distemper in the ferret (pp. 201–212), (2) experimental distemper in the dog (pp. 213–221), and (3) the nature of the virus (pp. 222–230).

It is concluded that the causative organism of this disease is a filtrable virus since (1) dog distemper can be transmitted from dog to dog, from ferret to ferret, or from ferret to dog by material in which no bacteria can be demonstrated and which yields no growth of organisms in ordinary culture media; (2) the infecting agent can be passed through bacterial filters of standard type and of proven quality; and (3) the infecting agent can not be cultivated in any straightforward manner so far employed.

The more important bacterial and protozoal diseases of poultry, J. P. RICE (*In National Veterinary Medical Association of Great Britain and Ireland, Annual Congress at Dublin, 1926. London, 1926, pp. 57–109*).—The bacterial

and protozoal diseases of poultry of importance in the British Isles here considered by the author include bacillary white diarrhea (pp. 57–73), coccidiosis (pp. 73–79), roup (pp. 79–90), tuberculosis (pp. 90–95), fowl typhoid (pp. 95–100), infectious entero-hepatitis (pp. 100–102), fowl cholera (pp. 102–104), and fowl plague (pp. 105, 106). The paper is said to be a summaryof existing knowledge, and many of the statements are based upon the author's own work. The data are presented in connection with a list of 115 references to the literature.

The inheritance of resistance to bacillary white diarrhea, E. Roberts and L. E. Card (*Poultry Sci., 6 (1926), No. 1, pp. 18–23*).—This contribution from the Illinois Experiment Station reports on the status of investigations under way, accounts of which have been previously noted (E. S. R., 54, p. 380).

The results as here presented led the authors to consider the following conclusions justified: "Great variation exists among chickens with respect to their resistance to infection with *S[almonella] pullora*. The occurrence of resistant chicks is such as to indicate a natural resistance that is hereditary. Chicks from certain hens are much more resistant to infection than are the chicks from other hens, when the measure of resistance is the percentage of chicks that survive an inoculation, at approximately 24 hours of age, with a pure culture of *S. pullora*. The occurrence of resistance is sufficiently consistent among chicks from certain hens and flocks to suggest that it may be possible to establish a strain of fowls that will be highly resistant to infection with *S. pullora*."

Rickets in chicks.—I, Variations in the antirachitic potency of different brands of cod liver oil, G. F. Heuser and L. C. Norris (*Poultry Sci., 6 (1926), No. 1, pp. 9–17, figs. 2*).—The authors find that different brands of cod-liver oil vary significantly in antirachitic potency when this factor is measured by means of chicks. "Growth is some measure of the antirachitic factor of cod-liver oil, as the presence of rickets finally retards growth. In these experiments the cod-liver oils of American origin gave results superior to those of Norwegian origin. With plenty of calcium and phosphorus in the ration, it seems probable that the amount of cod-liver oil required to protect against rickets will depend upon both the antirachitic potency of the oil used and the amount of this factor stored in the body of the chick at the time of hatching."

The injection of argyrol for the treatment of sinusitis in turkeys, E. E. Tyzzer (*Cornell Vet., 16 (1926), No. 3, pp. 221–224*).—In experiments conducted in the course of investigations of this condition of the turkey, it was found that when 1 cc. of fresh 15 per cent argyrol was injected into the distended antrum of an affected bird the swelling disappeared from the cheek and the corresponding nostril was dry within a period of several days. Of 13 other turkeys from a flock treated in this manner 9 recovered after a single injection, while 3 others responded to a second injection and a third injection was necessary for the recovery of the last of the 13.

This procedure is said to be very simple, requiring a minimum of time and effort. Where possible it is best, though perhaps not necessary, to empty the antrum by gentle pressure. Then with a hypodermic syringe inject 1 to 2 cc. of fresh 15 per cent argyrol into the cavity of the autrum, care being taken not to injure the eye nor to inject into tissues. The cheek should be punctured in front of and well below the eye in order to avoid the tear duct, which extends superficially over the upper portion of the antrum.

AGRICULTURAL ENGINEERING

Surface water supply of the United States, 1922.—Part 12, North Pacific Slope Drainage Basins, B, C (*U. S. Geol. Survey, Water-Supply Papers 553 (1926), pp. VI+295, pls. 2; 554, pp. V+186, pls. 2*).—These papers present

during the year ended September 30, 1922: B, Snake River Basin (in cooperation with the States of Idaho, Oregon, Nevada, and Washington); C, Lower Columbia River Basin and Pacific Slope Drainage Basins in Oregon (in cooperation with the States of Oregon and Washington).

Developing new land under irrigation, R. P. BEAN (*Washington Col. Sta. Pop. Bul. 136 (1926), pp. 5–28, figs. 10*).—Practical information is given.

Graphic representation of the Kopecky soil classification scheme for technical purposes, E. G. DOERELL (*Internatl. Rev. Sci. and Pract. Agr.* [*Rome*], *n. ser., 4 (1926), No. 2, pp. 307–311, figs. 3*).—A graphical representation of the Kopecky soil classification scheme is presented for the purpose of establishing distances between drains in soils. This soil classification scheme is brought into a system of sectors of a circle. The circumference of the circle is divided into 80 parts for the percentage content of the soil fraction with a diameter of less than 0.01 mm. On the radius the proportion of fraction II is drawn to contents of 40 per cent. The sectors so formed represent the types of soil. The direct reading, which corresponds to the distance between drains suitable to the mechanical composition of the soil as determined by analysis, can be taken from the graph with the compasses or any other aid. Curves are also given for the determination of distance between drains in layers of soil of varying permeability.

Durability of rammed earth walls, T. A. H. MILLER (*Agr. Engin., 7 (1926), No. 11, pp. 374, 375, figs. 9*).—In a contribution from the U. S. D. A. Bureau of Public Roads data are briefly presented to show the durability of rammed earth walls in building construction over long periods of years.

Strength tests of threaded pipe joints, J. G. DENT (*Agr. Engin., 7 (1926), No. 11, pp. 373, 374*).—Tests conducted at the University of Minnesota on the tensile strength of threaded pipe joints are briefly reported. The tests covered joints with engagements of 1, 2, and 3 threads as well as joints turned up tight and engaging approximately 7 threads. It was found that some pipe is defective in that it seems to be made up of at least two concentric layers with only a comparatively weak bond between them. In such cases the outer layer, when cut nearly or entirely through in the process of threading, slides off the underlying layers when the joint is subjected to tension.

Strength of lap soldered joints, J. G. DENT (*Agr. Engin., 7 (1926), No. 10, pp. 351, 352*).—In tests conducted at the University of Minnesota on the effect of different fluxes and solders on the strength of lap soldered joints a lap of ⅛ in. was used in all cases. Both surfaces to be united were tinned, but instead of running the soldering copper over the upper sheet the heat for sweating was applied by running the copper along the joint on top of the lower sheet and against the edge of the upper sheet. It was found that the strength of soldered joints increased regularly with the proportion of lead in the solder until the 50–50 mixture was reached, after which it fell off rather sharply. The 50–50 mixture of solder not only exceeded all other proportions in strength but as prepared in the laboratory showed a strength materially higher than commercial solder of the same nominal composition. Block tin was inferior to 50–50 commercial solder for joining copper. Black sheet steel was found to be very easily soldered if properly cleaned and produced a joint of fair strength. In this case 50–50 commercial solder was materially stronger than block tin. When the galvanizing was not thoroughly removed from galvanized steel before soldering the limiting element in the strength of the joint was found to be the adhesion between the steel and the zinc, and failure occurred by the solder pulling the zinc coating from the steel.

Public Roads, [December, 1926] (*U. S. Dept. Agr., Public Roads, 7 (1926), No. 10, pp. 193–208+[2], figs. 14*).—This number of this periodical contains the status of Federal-aid highway construction as of November 30, 1926, together with the following articles: Time Losses in Concrete Road Construction, by A. P. Anderson; Tests of Concrete Curing Methods, by J. T. Pauls; and Researches on Bituminous Paving Mixtures, by W. J. Emmons.

Yoking oxen to the plough: A new system, W. S. H. CLEGHORNE (*Union So. Africa Dept. Agr., Sci. Bul. 53 (1926), pp. 14, figs. 12*).—Experiments conducted at the Potchefstroom Experiment Station are reported, the purpose of which was to develop methods and yokes for the yoking of oxen to prevent side draft in single and gang plows.

The results showed that the formula $Di=6+(n+1)\ W$ can be used for calculating the proper width of yokes between skeys for different types of plows. In this formula Di is the width of yoke between skeys, n is the number of plow bottoms, and W is the width of cut of each plow bottom.

The use of the dynamometer in soil cultivation studies and implement trials, B. A. KEEN (*Jour. Roy. Agr. Soc. England, 86 (1925), pp. 30–43, figs. 3*).—An account is given of studies conducted at the Rothamsted Experimental Station on the use of the dynamometer in studying the factors involved in the draft of implements in soil cultivation.

The conclusion is drawn that if careful attention is given to adjustments in the dynamometer the variations in drawbar pull obtained on the chart can be definitely ascribed to variations in the soil resistance. Variations in hitch and set of the implement were found to have no measurable effect on the drawbar pull unless the depth of working was affected. Tests on adjustment of depth alone showed that over the normal range the drawbar pull was proportional to the depth. The slope of the land was found to have no effect on the drawbar pull for gradients up to 1 in 40. The effect of speed was also slight. An increase of from 2.5 to 4 miles per hour caused only a 7 per cent increase in drawbar pull. It is considered unlikely that the cost of the extra fuel needed to sustain this 7 per cent increase would be more than a small fraction of the saving.

In order to express this work a power factor was used which is defined as the product of drawbar pull and the time in seconds required to plow 1 ft. length of furrow. In many cases this factor was found more sensitive than drawbar pull alone. It is closely related to fuel consumption and can therefore be used when the costs of various operations are being compared.

The studies of the degree of uniformity of soil resistance on different fields showed that visual inspection is quite unreliable as an indication of uniformity.

The changes in drawbar pull across the field were found to reflect corresponding changes in the physical properties of the soil. Since the latter have an effect on the growth of plants, a relationship was found between drawbar pull and plant growth, especially in its early stages. For instance, the number of plants of winter wheat that survived the winter was greatest on those soils having the lowest drawbar pull, and the same relationship held for percentage of tillered plants. As growth proceeded the closeness of the relationship fell off, until at harvest there was no significant relation.

Rural electrification from an economic and engineering standpoint, L. S. WING (*Agr. Engin., 7 (1926), No. 10, pp. 345, 346, figs. 2*).—This is an abstract of a paper presented before the annual meeting of the American Society of Agricultural Engineers at Lake Tahoe, Calif., in June, 1926.

Data are presented which indicate that the distribution of electric energy to rural customers over the long transmission and distribution lines necessary can not be done at reasonable cost unless the cost is spread over a larger

amount of energy than is represented by ordinary family use for lighting and small household appliances, even though these be somewhat greater for the farm than for the city family. In other words, the supplying of electric energy to farm consumers at an economical rate is contingent on the development of the equivalent of an industrial load which might perhaps be designated as an agricultural load in its proper sense.

Electrically heated chick brooders, G. W. KABLE (*Agr. Engin.*, 7 (*1926*), *No. 11, pp. 376–378, figs. 11*).—This is an abstract of a paper presented at the twentieth annual meeting of the American Society of Agricultural Engineers at Lake Tahoe, Calif., June, 1926, giving the results of tests conducted by the Oregon Experiment Station to determine the characteristics and merits of electric brooders, commercial and otherwise, now in use, the merits of various ways of providing heat and ventilation, and the possibilities of improving on present practice.

For the laboratory work a special floor with a glass panel in the center was built at a height convenient for observations from above and below. Horizontal distribution of temperature was studied by thermometers placed in wire racks at a standard chick height of 2.5 in., and vertical temperature ranges by thermometers arranged in racks with steps 1 in. apart. Air movements were observed by noting the behavior of smoke under and around the hovers, and an anemometer was used for measuring air velocities. The brooders tested were classified as to methods of heating as (1) direct radiation, nonglowing, (2) direct radiation, glowing, (3) direct-indirect, and (4) indirect.

In a brooder with a rather steep gable roof it was found that a large volume of smoke, released under the hover spread out at the level of the lowest heating wire, apparently was dispersed by radiation and reflection from the sheet iron lining of the top, and for the most part came out under the edge of the hover with only a small amount emerging from the vents. When slitted canvas curtains, reaching nearly to the floor, were attached to the edge of the brooder a much larger proportion of the smoke passed out at the vents. When 2-in. vent tubes extending downward through the holes in the top to within 4⅝ in. of the floor were inserted, the smoke rose to the top of the brooder filling it down to the level of the bottom of the vent tubes. Smoke liberated under the hover of a flat-roof brooder spread out and more of it escaped through the vent than was the case with the gable roof construction. Smoke placed directly under a heating coil was spread out by the radiated heat, and when placed between the coils the movement was sidewise and out under the edge of the hover.

In a brooder differing from the above only in having the heating coils supported by hollowed out wooden strips, the air movement was exactly similar. In a conical shaped brooder with an inner heated area 35 in. in diameter and an outer unheated zone 55 in. in diameter surrounding the inner part, smoke placed between the inner and outer curtain had a slightly greater tendency to pass inward under the inner curtain and out of the vent than to escape through the outer curtain.

Tests with an octagonal pyramid brooder with an inner top joining the outer one 8 in. from the edge showed that when the top vent was closed and a special ventilating tube was installed the direction of movement was upward through the center tube and outward under the curtain, but the velocity of movement was extremely sluggish. When a similar tube of slightly different proportions was used with a 540-watt radiant heating element inside it, there was slightly more circulation upward through the heated tube than through the unheated tube used in the previous tests.

Tests of the effect of curtains and vent tubes on power consumption and ventilation showed that when the curtains were removed from the gable-roof type of brooder the cross ventilation beneath the hover was greatly improved,

with a corresponding loss in heat. With chicks under the hovers and curtains on both machines, the power consumption was greater for the brooder having vent tubes, indicating that the rate of air change and its attendant heat loss were greater than where tubes extending down inside the hover were not used.

In tests to determine the effect on vertical heat distribution of raising the brooder, it was found that with no change in the thermostat setting the temperature was lowered at all observation points from 0.25 to 5 in. above the floor. However, there seemed to be no simple or consistent relation between the amount of elevation and the temperature changes. The outstanding effect was a relatively greater excess of temperature at the 0.25-in. level as compared with other strata in the zone of observation.

Tests of the uniformity of temperature control by the thermostatic arrangement on the various brooders showed at chick height a range in temperature variation from 3.5° down to an amount too small for observation.

The results as a whole indicate that none of the brooders tested had less than 39 changes of air per hour, ranging to as high as 204. The cross ventilation under the curtains of most brooders is estimated to exceed that measured at the vents. Slatted floors covered with burlap do not affect the ventilation but do reduce the sweating. Sweating occurs less in warm weather, and there is less trouble of this kind under hovers heated with coal and oil stoves and electric hovers of the radiant heater type. It is concluded that sweating is not controlled so much by ventilation as by the temperature of the floors and the lower part of the chick's body. In the actual brooding tests of several electrically heated brooders operating in comparison with a coal-burning hover, the growth of chicks was practically identical but the mortality was higher with the electric brooders.

Artificial drying of crops in the stack, J. HENDRICK (*Highland and Agr. Soc. Scot. Trans., 5. ser., 36 (1924), pp. 141–160*).—The results of a series of investigations conducted at the University of Aberdeen in Scotland on the artificial curing of hay and grain crops in the stack by blowing a blast of air through them are reported. The procedure was based on the heating of grain crops in the stack and subsequent cooling and drying under an air blast.

The results are taken to indicate that much is yet to be learned before crops can be dried with certainty and economy by means of an artificial air blast. It is necessary to know more of the conditions under which heating takes place in stacks. It was found, for instance, that damp oats did not heat much in stacks and such heating as did take place was very uneven. It was also found that stacks must be built so that the air will pass fairly freely through all parts. As the pressure is greatest in the bottom of the stack, this will normally be the part through which the least air passes. It is therefore necessary to arrange the stack around a conical boss or in some other way to provide the thinnest layer of material in the lower part of the stack.

Another difficulty found in carrying out the process, especially in a rainy climate or in rainy weather, is that the undried material absorbs rain readily, and it is therefore difficult to dry the head of the stack in unsettled weather. Where possible, therefore, the stacks should be dried under cover.

Poultry houses and equipment, N. R. MEHRHOF (*Fla. Univ. Agr. Ext. Bul. 45 (1926), pp. 20, figs. 17*).—Practical information on the planning and construction of poultry houses and equipment to meet Florida farm conditions is presented, together with working drawings and bills of materials.

Protection of buildings and farm property from lightning, R. N. COVERT (*U. S. Dept. Agr., Farmers' Bul. 1512 (1926), pp. II+33, figs. 26*).—This is a revision of and supersedes Farmers' Bulletin 842 (E. S. R., 38, p. 15) and gives practical information on how to protect buildings from lightning.

Water and sewerage systems for Florida rural homes, F. Rogers (*Fla. Univ. Agr. Ext. Bul. 46 (1926), pp. 20, figs. 11*).—Practical information on the planning and construction of water supply and sewage disposal systems for Florida rural homes is presented, together with working drawings of different types of systems.

RURAL ECONOMICS AND SOCIOLOGY

Studies in Vermont dairy farming.—II, Enosburg, Franklin Co., area, P. K. Hooker (*Vermont Sta. Bul. 256 (1926), pp. 45, pls. 4, figs. 12*).—This is the second of the series previously noted (E. S. R., 54, p. 882) and is based on records of farm business from June 1, 1922, to May 31, 1923, secured from 114 out of a total of 154 farms in the town of Enosburg, Franklin County. The object of the study is to analyze in their relation to profits (1) the factors entering into the cost of making dairy products, and (2) the methods of disposing of the product.

The receipts from the net cattle sales and increase cattle inventory and from the milk products sold amounted to 7.1 and 67.6 per cent, respectively, of the total farm receipts. Detailed discussions with tables and graphs are made of the effects on profits of land values, total capital invested, capital invested in cows, number of cows per farm, acreage per farm and per cow, housing costs, quality of sires and cows, length of the lactation period, amount of grain fed, labor costs, use of milking machines, winter and summer dairying, and different methods of disposing of products. Net earnings on land values from $11 to $20 per acre were greater than on lower or higher valued land. A higher profit per cow was made on medium-sized farms having $10,000 to $16,000 invested in the business, and the net earnings increased steadily as the percentage of capital invested in cows increased. Farms with 20 to 30 cows and those with 126 to 150 acres of crop land and open pasture showed the highest profits per cow. Farms averaging 4 acres of crop land and open pasture per cow showed 177 lbs. of butterfat and $4 profit per cow, as compared with 171 lbs. and —$8 and 161 lbs. and —$12 for farms averaging 6 and 9 acres, respectively.

Housing cost varied from 74 cts. to $11.73 per cow, the highest profit per cow being made from those housed at a cost of from $2 to $2.99. Seventy-five purebred and grade herds showed a loss of $1 per cow as compared with a loss of $12 per cow in 39 herds of mixed lots and "scrubs." The 11 herds headed by purebred sires for at least 15 years showed $1.36 profit per cow as compared with a loss of $4.84 per cow for all farms. Profits increased rapidly as the rate of production increased up to $9 per cow in the 175–200-lb. butterfat group, after which the profits were nearly constant, except for the 275 lbs.-and-over group, which returned $33 per cow. Cows yielding 200 lbs. and over of butterfat on from 750 to 1,250 lbs. of grain gave the highest profit. Profits per cow increased steadily from —$23, where less than 25 per cent of the product sales were in the winter, to $8 per cow where 45 per cent and over of the sales were in the winter. Sale of cream resulted in but $1 greater loss per cow than sale of milk, but shifting from one to the other was $6 per cow less profitable.

The wide difference in the correlation coefficient between profit per cow and price received per pound of fat (0.3070 ± 0.0578) and that between profit per cow and cost per pound of fat (-0.9328 ± 0.0082) indicates that the reduction of cost offers better opportunity for increasing profits than does an attempt to secure higher prices.

efficiency in the operation of creameries and presents a method for judging the efficiency of individual creameries. The analysis is based upon the data of Black and Guthrie previously noted (E. S. R., 53, p. 489), revised to fit 1925 conditions.

The price paid for butterfat was found to be the best test of creamery efficiency. Curves are presented showing the effect on the price paid for butterfat of varying the price of butter, the creamery margins, and the overrun. Tables are given showing the effect on overrun of underreading the butterfat test and underweighing cream. The largest single factor affecting creamery costs per pound of butter is volume of business or output. Tables and curves are presented showing by different outputs the average cost per 1,000 lbs. of butter in 88 Minnesota creameries in 1925 of equipment, building and site, labor and management, supplies and miscellaneous expenses, and total cost. The computation of these costs for an individual creamery is illustrated. Indexes of costs of constructing creamery buildings of various types as compared with 1925 are given by 5-year periods from 1900 to 1925, and the method of making adjustments in computations necessitated by changes in construction costs, wages and salaries, prices of equipment and supplies, etc., are explained. The probable reasons for high costs in each class of costs are summarized.

Cost of producing crops in North Dakota, R. E. Willard (*North Dakota Sta. Bul. 199 (1926), pp. 32, fig. 1*).—The various items of costs, costs per acre, and costs per unit of yield for wheat, flax, rye, oats, barley, potatoes, millet, alfalfa, sweet clover, and corn for grain, fodder, silage, and hogging down are presented for the State as a whole and for the four geographical sections—the Red River Valley, central, northwestern, and southwestern divisions. The greater part of the records covered the years 1921 to 1923, inclusive. Those for wheat for the State covered 1919 to 1925, and those for flax and rye, 1921 to 1925. The method of calculating costs is the same as that used in Bulletin 165 previously noted (E. S. R., 48, p. 490). The cost per acre of producing crops decreased about 60 per cent from 1920 to 1925, due to lowering of the price levels of commodities used by farmers, land rent, value of farmers' labor, and increased efficiency of the farmers.

Cost of filling silos, P. E. McNall and W. A. Hartman (*Wisconsin Sta. Bul. 386 (1926), pp. 12*).—Data from 282 farms in 1921 to 1923, inclusive, show the cost of filling silos averaged $2.06 per ton, varying from $2.39 for silos of 50 to 70-ton capacity to $1.89 for those having a capacity of over 111 tons. The difference in cost consisted of 5 cts. for man labor, 3 cts. for horse labor, 11 cts. for use of silo, 22 cts. for use of equipment, and 9 cts. for interest. The cost per ton for engine and cutter varied from 37 cts. for the smaller silos to 33 cts. for the larger silos when the engine and cutter were hired, and from 43 to 24 cts. when owned, indicating that hiring was cheaper for silos of less than 100 tons capacity.

Agricultural credit in Jugoslavia, M. K. Djordjević (*Belgrade Econ. Rev., 1 (1926), No. 1–2, pp. 3–6*).—A brief description of the organization and operation of the Agricultural Credit Management, district treasuries for agricultural credit, and local agricultural treasuries under the Agricultural Credit Law of June 12, 1925.

Services in cotton marketing, A. B. Cox (*U. S. Dept. Agr. Bul. 1445 (1926), pp. 40, figs. 9*).—The delivery of cotton from the farm to the mill necessitates the services of preparation, standardization, classing, assembling and distributing, warehousing, inspection and regulatory work, financing, and furnishing information, the payment for which services constitutes the spread between what the grower receives and what the spinner pays. The functions of the several services, the present practices, and the assistance given by and the regulations of the Federal and State Governments and private agencies are

Business set-up of a cooperative marketing association, C. L. Christensen (*U. S. Dept. Agr., Dept. Circ. 403 (1926), pp. 14*).—A brief general discussion is given of the problems involved in the development of a cooperative marketing organization. The type of organization; membership relations, including marketing contracts; financing, including problems of fixed capital and of marketing and production credit; management; and selling program are considered.

A students' list of works on co-operation (*London: Horace Plunkett Found., 1926, pp. 20*).—This is a list of 227 works on cooperation recommended by the Horace Plunkett Foundation. It is divided into works on (1) theory, organization, etc., of agricultural cooperation; (2) industrial cooperation (productive and distributive); (3) cooperation in specific countries; (4) cooperation in marketing of agricultural produce; (5) cooperative credit; and (6) rural economics, general economics, land, country life, and labor.

International yearbook of agricultural legislation (*Internatl. Inst. Agr. [Rome], Internatl. Yearbook Agr. Leg., 14 (1924), pp. XLIV+1191; 15 (1925), pp. XXXV+1104*).—These volumes continue the series previously noted (E. S. R., 51, p. 794) and give for the respective years the text for the various countries and a summary for the world of the current legislation regarding agricultural and commercial statistics; trade in agricultural products, including machinery, fertilizers, and livestock; financial laws and customs legislation as affecting agriculture; plant production and industries; animal production and industries; agricultural organization and training; plant diseases and pests noxious to agriculture; agricultural cooperation, insurance, and credit; rural property and land settlement; relations between capital and labor in agriculture; and rural hygiene and the policing of country districts.

[Summary of agricultural legislation, 1924] (*Cent. Landowners' Assoc. [London] [Pub.] 6 (1925), pp. 31*).—A brief summary is given of the principal legislation enacted by Parliament during 1924 affecting agricultural interests in England and Wales. The rules and orders of the Minister of Agriculture and Fisheries under the Agricultural Wages (Regulation) Act of 1924 are included.

The tariff on wool, M. A. Smith (*New York: Macmillan Co., 1926, pp. XXII+350, pls. 4, figs. 20*).—The Institute of Economics has undertaken, as part of an analysis of the system of customs duties of the United States, a series of special investigations on the relation of the tariff to particular lines of production. This study on wool is the second of the series dealing with agricultural commodities, the first of which was previously noted (E. S. R., 51, p. 690). Part 1 of this study describes the growth and extent of the sheep industry in the United States and in competing countries; part 2 gives a brief history of the wool duties in the United States; and part 3 discusses the elements of the wool tariff problem, the proposed bases for a wool duty, the effects of a duty on wool upon sheep husbandry and the cost of woolen goods, and the questions of public policy involved.

The study indicates that if the present duty (31 cts. per scoured pound) is maintained the domestic production will probably increase slowly for several years, that if a much higher duty is imposed the output will probably not increase to any marked extent because of the increased costs of production and the fall in the price of mutton and lamb, and that if the present duties are abolished there will probably result an immediate decrease of 10 or 15 per cent in the domestic production. The general conclusion is reached that when a comprehensive readjustment of the tariff rates in the United States is made, wool should be placed upon the free list.

Appendixes contain a study of wool prices and the tariff from 1860 to 1924; index numbers of the monthly wholesale prices by groups of commodities and the yearly wholesale prices from 1910 to 1925 and monthly prices from

1921 to 1925 of woolen goods; a review of the production, marketing, and use of carpet wools; and an inquiry as to the best method of calculating costs in cases of joint production, such as wool and mutton. A bibliography is included.

The cattle industry and the tariff, L. R. EDMINSTER (*New York: Macmillan Co., 1926, pp. XV+331, figs. 9*).—This is the third of the series of special investigations of the Institute of Economics noted above. The study is limited to the duties on cattle and beef. The nature, development, and present status of the domestic industry are discussed. The competitive situation is described with a view to showing how far the industry is dependent on protective duties. The efficacy and public expediency of duties on cattle and beef are considered.

The decline of the cattle industry has been in the main due to range lands having been settled up and put to more intensive use and the inability of the industry to compete with other agricultural pursuits on tillable lands. Production can be increased only at increasing costs. The demand for beef in the United States is distinctly elastic, and there is a marked tendency to use substitutes when prices rise. Duties on cattle and beef in the past have not had an appreciable effect on domestic prices and have been a negligible factor in the evolution of the industry. Neither Canada nor Mexico has been able to compete with the United States in fat animals, and the importation of lean animals from those countries has not been sufficient to have any marked effect on prices. The demand in the United States for beef of the type that would have to be imported from overseas is small, and it is doubtful whether the amount excluded by duties has appreciably affected prices.

The conclusions are reached that the domestic cattle industry in its present state is dependent very little, if at all, upon duties on cattle and beef; that the conditions under which future duties can increase prices and stimulate production are peculiarly difficult; and that protective duties for the cattle industry will eventually impose a burden on the public out of proportion to any gains that may accrue.

Studies of the production of cattle in the United States and Argentina and statistical tables are given in the appendixes. A bibliography is included.

American importation of Canadian wheat, A. E. TAYLOR and E. M. BRAND (*Wheat Studies, Food Research Inst. [Stanford Univ.], 3 (1926), No. 1, pp. 76*).—From 1921–22 to 1925–26 the United States imported an average of 9,728,000 bu. of wheat from Canada annually in bond to be ground and the flour exported, and an average of 6,313,000 bu. for domestic consumption, the latter paying a duty of 30 to 42 cts. per bushel. The production and classes of wheat produced in the two countries, the manufacturing considerations, transportation, relative prices, and other factors affecting the importation for domestic consumption and for export of flour are discussed. A table is included showing the daily prices of comparable grades of dark northern spring wheat in Minneapolis and of Manitoba northern wheat in Winnipeg from July 2, 1923, to June 30, 1926.

Survey of the wheat situation, August to November, 1926, M. K. BENNETT, J. S. DAVIS, ET AL. (*Wheat Studies, Food Research Inst. [Stanford Univ.], 3 (1927), No. 3, pp. 141–175, figs. 8; Sup., pp. 2*).—A continuation of the studies previously noted (E. S. R., 55, p. 786), including a study of the crop developments, price movements, rate of marketing, international trade, the effect of the advance in ocean freight rates, and the international position and outlook.

The world wheat situation, 1925–26: A review of the crop year, J. S. DAVIS ET AL. (*Wheat Studies, Food Research Inst. [Stanford Univ.], 3 (1926), No. 2, pp. 77–140, figs. 12*).—This is the third of the series previously noted (E. S. R., 54, p. 884) and reviews the production, consumption, stocks and carryovers, price movements, and the milling of, and the international trade in wheat during the crop year 1925–26. Relevant statistical data are pre-

sented in appendix tables. The progress and workings of the Canadian Wheat Pool, returns to wheat growers in different countries, and the developments in future trading markets are discussed.

The Producers' and Consumers' Conference, held at Bathurst, New South Wales, September, 1926 (*Sydney: Govt., 1926, pp. VI+105, pls. 35, fig. 1*).—This is the report of the conference convened at Bathurst by the Minister for Lands of New South Wales to trace the causes of the disparity in prices and the waste of foodstuffs and to make proposals for improvements and reforms. The conference was attended by 139 producers' representatives, 61 consumers' representatives, and 19 special official representatives. The reports of the 13 producers' committees, each dealing with the marketing problems of particular industries or branches or groups of industries, of the 4 consumers' committees dealing with the questions of distribution of different groups of commodities, of the special committees on transportation, marketing facilities, finances, and weights and measures, and of the executive committee are given.

Statistics and graphs on production, consumption, prices, exports, imports, etc., for the several commodities, and other matter pertaining to agricultural organization, legislation, and production, and the assistance given by the Commonwealth to production and export of primary products are included in part 2.

The rural industries of England and Wales.—I, Timber and underwood industries and some village workshops, H. E. FitzRandolph and M. D. Hay (*Oxford: Clarendon Press; New York: Oxford Univ. Press, Amer. Branch, 1926, vol. 1, pp. XIV+239, pls. 11*).—This is the first of a series of four volumes giving the results of a survey made on behalf of the Agricultural Economics Research Institute of Oxford University to determine (1) the existing rural industries and the causes of their establishment in particular localities; (2) the various types of organization in these industries; (3) the economic and social factors of rural industries, the conditions of labor attendant on them, the connection between such industries and agricultural employment, and how far such industries tend to depress or ameliorate the lot of the agricultural worker; and (4) the prospects of development of existing industries, the introduction of new enterprises, and the reviving of former industries.

Handbook of rural social resources, H. Israel and B. Y. Landis (*Chicago: Univ. Chicago Press, 1926, pp. X+204*).—Part 1 consists of 14 articles by specialists on different phases of recent achievements and developments in rural life. Part 2 comprises statements of the programs and present services of the national agencies that are members of the National Council of Agencies Engaged in Rural Social Work.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Tenth annual report to Congress of the Federal Board for Vocational Education, 1926 (*Fed. Bd. Vocat. Ed. Ann. Rpt., 10 (1926), pp. XI+171, figs. 12*).—This report presents a general report of the work of the board, a statistical report, and special reports of the different services, among which are the following:

Home economic education service (pp. 15–43).—The growth and developments during the three years ended June 30, 1926, in enrollments, programs of instruction, methods of handling the work, etc., in school and class; teacher training, and negro education are reviewed, and the aims of the next three years outlined.

Agricultural education service (pp. 44–83).—The enrollment, types of schools, and distribution of expenditures to Federally aided agricultural schools are

discussed. The progress and developments during the past three years in State programs, part-time evening schools, methods of teaching, supervised practice, and the improvement of teachers are reviewed.

Suggestive course outlines for vocational agriculture, J. E. HILL, A. W. NOLAN, and C. S. ANDERSON (*Ill. Bd. Vocat. Ed. Bul. 37 (1926), pp. 110, figs. 8*).—This bulletin is planned as a guide to aid boards of education and administrators in establishing and conducting departments of vocational agriculture and to help teachers in organizing and teaching the various courses. Suggestive course outlines, with reference books, are given for crops and soils, animal husbandry, and farm-mechanic enterprises. The method of planning and organizing material for teaching each job in the various enterprises is illustrated by a lesson plan or a "teaching layout" of a particular job, and a stenographic report of a class recitation. An appendix gives suggestions relative to supervised farm practice of students, special activities for agricultural departments of schools, and plans, equipment, and apparatus, and the plan of the Illinois Board for Vocational Education for vocational agriculture.

Make extension work more effective, M. C. WILSON and W. W. CLARK (*Wisconsin Sta. Bul. 387 (1926), pp. 32, figs. 12*).—This study was made to ascertain the effect of service in materials upon the value of service in information in extension work, to what extent farmers adopt practices advocated by extension workers, and the effectiveness of different types of extension teaching. It is based upon 715 records collected by survey parties in a detailed survey of an alfalfa introduction project, and represents 93 per cent of the farms in 3 areas of 1 to 2 townships in size located in Clark, Winnebago, and Waushara Counties, Wis.

In Waushara County alfalfa requires lime, inoculation, hardy strains of seed, and careful culture. Although there was no county agent in this county, considerable extension work had been done by the agricultural college and lime and other materials could be had, yet up to 1923 only 15 per cent of the 240 farmers interviewed had started alfalfa. Following the establishment of satisfactory service in materials in 1923, the number of growers increased to 63 per cent in 1925. In Clark County before 1924, lime and seed had been available, but there was no local extension information and only 5 or 6 farmers grew alfalfa. In the two years following the first extension work more than 20 per cent of the farmers started growing alfalfa. In Winnebago County, where materials are not essential for alfalfa growing, the practice had been gradually adopted during the previous 20 years, and in 1925, 93 per cent of the farmers were growing alfalfa.

Eighty-six per cent of the growers attending extension activities or making contacts with extension workers regarding alfalfa reported that they had been influenced by such work. Meetings, particularly farmers' institutes, influenced 76 per cent of those attending and 47 per cent of all growers; news stories and bulletins influenced 81 per cent of those reached and 41 per cent of all growers; and adult demonstrations and farm visits, 61 and 46 per cent, respectively, of those reached, and 10 and 4 per cent, respectively, of all growers.

Data regarding other phases of extension work, as well as alfalfa, in the 3 areas show that of the practices influenced, 65 per cent were influenced by propaganda methods, 13 by personal service, 14 by object lessons, and 22 per cent indirectly. Condition of land occupancy, size of farm, and character of roads were found to have had but little effect on the adoption of better practices due to extension efforts.

The teaching of science and the science teacher, H. BROWNELL and F. B. WADE (*New York and London: Century Co., 1925, pp. XI+322, pls. 4, figs. 9*).—A textbook for teacher-training institutions and teachers desiring suggestions in science teaching. It is prepared with special reference to the relationship

of science teaching to education in general, particularly in secondary schools and the upper elementary grades.

Marketing of farm products, A. H. Benton (*Chicago and London: A. W. Shaw Co., 1926, pp. XVIII+427, figs. 50*).—This book is intended for students beginning the study of marketing agricultural products, for farmers, and for business men. An analysis is made of the scope of marketing, its mechanical make-up, the methods used, and the services rendered, both under the old established private marketing system and the producers' cooperative marketing organization. The most important agricultural products of the United States and the less important ones presenting distinctive features are taken up in separate chapters. Other chapters review legislation relating to marketing agricultural products and the essential factors and difficulties involved in cooperative marketing. The appendix includes statistics of regional marketing associations, Federal classification standards for different products, and other information as to marketing and marketing organizations. References and self-test questions are included for each chapter.

Farm accounting: Principles and problems, K. F. McMurry and P. E. McNall (*Chicago and London: A. W. Shaw Co., 1926, pp. XIII+329, figs. 12*).—A textbook for college and high school classes in farm accounting. Part 1 covers the general principles of bookkeeping and accounting and special features and problems of farm accounting. Part 2 deals with additional records necessary to obtain cost records, the methods of determining valuation, the types of entries for different items, the use of farm cost accounts, etc.

Principles and practice of farm book-keeping, L. F. Foster (*London: Gee & Co., pp. VIII+476*).—A textbook of the principles and practice of farm book-keeping covering the knowledge necessary in the subject for degree and diploma in universities and colleges of England teaching agricultural and allied subjects.

Controlling expense by standards, S. A. Donham (*Jour. Home Econ., 19 (1927), No. 1, pp. 1–7*).—The procedure for making a household budget is outlined. The items of expense are grouped under savings, shelter, food, operating, clothing, and development, with each group subdivided into fixed charges, charges possible to estimate, and charges necessary to limit.

Rural sociology, C. C. Taylor (*New York and London: Harper & Bros., 1926, pp.* [7]+*509*).—This textbook is a study of rural problems and brings together a consideration of outstanding specific problems of rural life and the general principles of the science of sociology. Part 1 considers the foundations of rural society; part 2 the problems of rural isolation, tenancy and ownership, the rural home and family, the rural church, rural education, rural health, rural recreation, and rural art, and adequate rural religious and educational programs; and part 3 the farmer and his community, his town, his government, and civilization, and rural social psychology.

How to do research work, W. C. Schluter (*New York: Prentice-Hall, 1926, pp. VII+137, figs. 4*).—This book attempts to explain "in understandable terms the fundamental tool of research, method, in relation to the actual procedure of discovering and solving research problems."

Research is stated to include (1) discovery of the problem and (2) methods of its solution. The steps in research procedure which are discussed in different chapters of the book are as follows: (1) Selecting the field, topic, or subject for research; (2) surveying the field to apprehend the research problem; (3) developing a bibliography; (4) formulating or defining the problem; (5) differentiating the elements in the problem and outlining; (6) classifying the elements in the problem on the basis of their relation to data or evidence (direct or indirect); (7) determining the data or evidence required on the

data required; (9) testing the solvability of the problem; (10) collecting the data and information; (11) systematizing and arranging the data preparatory to their analysis; (12) analyzing and interpreting the data and evidence; (13) arranging the data for presentation; (14) selecting and using citations, references, and footnotes; and (15) developing the form and style of the research exposition.

The author recognizes that it is not possible "to formulate any rigid theory of procedure which shall be correct regardless of actual conditions in practical fields of research," and that "methodology, because of its dynamic nature, being a means, not an end, defies portrayal in terms of formula or standardization." Nevertheless, it seems to him possible "to describe and explain the dynamic elements in research method in such a way that their validity and their soundness as guiding principles in the conduct of actual research in all fields may be attested by the consensus of informed opinion on research methods."

The book is addressed to and should be of service to directors of research and teachers and students of research methods, as well as to those actually engaged in organizing and conducting research. It deals with "the fundamentals of all research method," but "with their particular application in the field of business and social economy." The subject is presented in a concise, lucid, and orderly manner.

FOODS—HUMAN NUTRITION

The bacteriology of food, C. DUKES (*London: H. K. Lewis & Co., 1925, pp. IX+180, figs. 25*).—A text for college use written particularly for students of public health, but "of interest to bacteriologists, of whatever class, who are curious about the behavior and significance of microbes which do not belong to the special groups of which they have expert knowledge, and who seek to gain a wider outlook than is given them by their own specialized department."

Food from grains, A. MAURIZIO (*Die Nahrungsmittel aus Getreide. Berlin: Paul Parey, 2. ed., rev., 1924, vol. 1, pp. XII+461, pls. 2, figs. 180; 1926, vol. 2, pp. VIII+226, pl. 1, figs. 5*).—A revision of the volumes previously noted (E. S. R., 42, p. 456).

The chemical composition of the food grains, vegetables, and fruits of western India, D. L. SAHASRABUDDHE (*Bombay Dept. Agr. Bul. 124 (1925), pp. 38*).—A compilation of data for the most part obtained in the chemical laboratory of the Department of Agriculture, Bombay, India. The data include proximate analyses of various native food grains and vegetables, and acidity and total reducing and nonreducing sugars of various fruits, including plantains, pomegranates, grapes, figs, guavas, citrus fruits, mangoes, and dried dates and figs.

The energy value of milk as related to composition, O. R. OVERMAN and F. P. SANMANN (*Illinois Sta. Bul. 282 (1926), pp. 207–218, fig. 1*).—This publication includes details of the statistical methods by which the formulas given in a progress report (E. S. R., 56, p. 392) were derived and a discussion of the application of the formulas.

Fat soluble vitamins.—XXII, The comparative amounts of vitamin A and antirachitic factor in butter fat and cod liver oil, J. H. JONES, H. STEENBOCK, and M. T. NELSON (*Jour. Metabolic Research, 6 (1924), No. 1–6, pp. 169–187, pls. 2, figs. 4*).—This part of the investigation previously noted (E. S. R., 53, p. 264; 54, p. 489) consists of a comparative study of the potency of the same samples of butter and of cod-liver oil as sources of vitamin A and vitamin D. The vitamin A studies were conducted on rats and the vitamin D on dogs. The butterfat was obtained from the Wisconsin University creamery in November as a representative sample of a day's churning, and the cod-liver oil was a well-known commercial product.

Using the time of incidence as well as the cure of ophthalmia as criteria, the vitamin A content of the cod-liver oil was estimated to be from 10 to 20 times as high as that of the butterfat. As a source of vitamin D, or antirachitic vitamin, 0.05 gm. of the cod-liver oil proved more effective than 10 gm. of butterfat in preventive experiments, indicating that the oil is about 200 times as potent as the butterfat.

"The above values, of course, are not to be taken as absolute figures. They are bound to vary with the seasonal conditions under which the butterfat and cod-liver oil are produced and the method of preparation of the latter. In the light of knowledge that under certain conditions the antirachitic factor as well as vitamin A is required for normal growth, the statement that cod-liver oil may be 250 times as potent as butter may be taken to refer more to the antirachitic factor than to vitamin A."

Vitamin B in commercial meat residue and commercial egg albumen, G. R. Cowgill (*Amer. Jour. Physiol., 79 (1927), No. 2, pp. 341–345, fig. 1*).—Commercial meat residue (the insoluble residue obtained in the manufacture of commercial beef extract) and cooked commercial egg albumin were found to be markedly deficient in vitamin B as tested by feeding as the sole source of this vitamin to rats in amounts constituting 44 and 35 per cent, respectively, of a ration having a caloric value of approximately 5.2 calories per gram.

Foods and cookery: A handbook for homemakers and teachers of home economics, compiled by M. H. Haggart (*[Ames]: Iowa Homemaker, 1926, pp. 254, pl. 1, figs. 26*).—This practical handbook on food selection, preparation, and service, is a contribution from the foods and nutrition staff of the Iowa State College. As stated in the foreword by A. E. Richardson, "it is not only a compilation of the best of Iowa's recipes, but it has valuable dietetic information simply told, suggestions as to how to plan and serve meals, chapters on marketing, selection of foods, and table service."

Better homes recipe book, M. Mills (*Boston: Boston Herald-Traveler, 1926, pp. VIII+493*).—A collection of tested recipes "essentially true to New England and New England traditions," with supplementary chapters on garnishes; temperatures, weights, and measures; suggestions for the diet of children; and selected menus for each month of the year and for special occasions.

The physiology of taste, J. A. Brillat-Savarin (*London: Peter Davies, 1925, pp. XX+326, illus. 41*).—To commemorate the centenary of the death of Brillat-Savarin his famous Physiologie du Goût has been translated into English, this volume being one of a special limited edition of 750 copies. The volume contains an introduction by A. Machen and a short biographical sketch in which it is noted that, with the exception of a translation appearing in 1883 in a small limited edition under the title of A Handbook of Gastronomy, no other complete translation has been published in England.

The physiology of taste (*Jour. Home Econ., 18 (1926), No. 9, pp. 520–522*).—An editorial comment on the above with a plea for greater attention in meal planning to the sense of taste and its influence upon nutrition. "We think of meal-planning so much in terms of vitamin and minerals, protein and calories, that we forget it may also mean a skillful combination of flavors and textures by which the appetite is whetted and satisfied without danger of overeating."

The value of cocoa and chocolate as sources of protein in the diet, H. H. Mitchell, J. R. Beadles, and M. H. Keith (*Jour. Biol. Chem., 71 (1926), No. 1, pp. 15–31*).—As determined by the method employed in previous studies (E. S. R., 56, p. 188), the nitrogen of cocoa was found to have an average coefficient of digestibility (corrected for metabolic nitrogen in the feces) of 38 and an

average biological value of 37. A mixture of cocoa and milk containing equal parts of nitrogen and fed at a crude protein level of approximately 8 per cent gave a digestibility figure of 63 and a biological value of 70. These values are not far from the estimated values on the assumption that there is no supplementing action between cocoa and milk.

Since cocoa has an average crude protein content of 21.5 per cent, it would contain 8.2 per cent of digestible crude protein and only 3 per cent of net protein, showing that cocoa must be classed as an unimportant protein food. Chocolate containing a smaller percentage of crude protein would be even less important as a source of protein.

In the course of the investigation evidence was obtained that cocoa contains 0.55 per cent of creatinine and 0.24 per cent of creatine.

The effect on reproduction and lactation of differing proportions of meat in a mixed diet, F. L. MacLeod (*Amer. Jour. Physiol., 79 (1927), No. 2, pp. 316–320*).—The experiments reported in this study are regarded by the author as only preliminary in that they were continued for only a year. "For such experiments to be conclusive the number of animals studied should be much larger, each experimental animal should be continued on the diet at least through the entire reproductive life, and the diet should be studied through several generations."

In the first series of experiments the meat was fed fresh and raw in amounts of 10 and 40 gm. per rat per week as a supplement to a dry diet consisting of whole milk powder 12, powdered lemon juice and corn sirup 5, butterfat 5, dried spinach 2, dried carrot 5, patent flour 30, and starch 41 per cent. Four lots containing 2 males and 3 females each were placed on this diet at the age of 5 or 6 weeks, two lots receiving the small and two the liberal meat allowance, and were continued on the diet until they were slightly more than a year old. The adult animals ate an average of 70 gm. of dry food per week, thus making the intake of protein about 9.9 and 17.5 per cent of the food solids in the two diets.

The growth records in both groups were normal. To the 3 females continued on the low meat diet until the end of the experiment 6 young were born and none were raised, whereas 78 were born to the 3 females on the high meat diet and 30 of these were raised to the standard age of weaning. The average weight of the young on weaning was 29.1 gm., which is below the average normal weight at this age. One male and 2 females from every litter born on the meat diet were continued on this diet. All grew at a subnormal rate and were extremely nervous, and although there was considerable breeding only one litter of 5 was raised.

In a second series the meat was dried and incorporated in the dry diet, which was the same as that of the first series except that the meat replaced an equivalent amount of starch. Two lots, one on the high and the other the low meat, were started when the animals were 5 or 6 weeks old and two other lots at from 3 to 4 months of age.

There was less breeding on the dry than on the fresh meat diet and not so marked a difference between the low and high feeding. Two of the 4 females on the low meat diet bred, and one litter of four was raised. Of the 6 females on the high meat diet only 2 bred, one of these producing 35 young, of which 32 were raised to weaning. There was no breeding in the second generation.

An additional series of experiments was run on the dried meat diet, with an increase in the amount of dried milk from 12 to 16 per cent. This increase, while producing no significant change in the rate of growth, made possible successful rearing of the young on the diet containing only 8 per cent of dried

"Although, in general, these experiments seemed to show improvement in reproduction when the proportion of meat in the diet was increased, it must be pointed out that the results are not conclusive. Nearly all of the animals were unusually nervous and somewhat below the general average of our colony in vigor. Further experiments of this type are needed to determine whether the use of other vegetables or the same vegetables in different proportions would give better results."

Infant feeding in the Tropics, R. BROOKE (*Amer. Jour. Trop. Med., 6 (1926), No. 6, pp. 403–419*).—In the opinion of the author, the problem of infant feeding in the Tropics differs from that of temperate zones in two respects only—quantity and substitutes. Owing to the continuously hot and humid climate the caloric requirements are considered to be lower and the dangers from overfeeding higher than in temperate zones. The difficulty in securing fresh milk and preventing spoilage makes it necessary to use substitutes for artificial feeding. For this purpose powdered milk is considered more satisfactory than condensed milk. Since 1923 powdered milk (Klim) has gradually replaced condensed milk for infant feeding in the Canal Zone. Coincident with this change has been a decrease of over 50 per cent in the incidence of malnutrition and nonspecific diarrhea among the infants under 2 years of age at the Ancon Hospital.

Tables are given of formulas for children from 2 days to 12 months of age, using fresh milk and Klim, with Karo as the sugar. A table of lactogen formulas is also given. Suggestions are included for the dietary treatment of fat constipation, dyspepsia, marasmus, cholera infantum, and diarrhea.

The phosphorus intake of pre-school children as shown by a dietary study made by the individual method, H. MCKAY (*Ohio Sta. Bul. 400 (1926), pp. 387–425, figs. 10*).—Although the primary purpose of this study was to determine the phosphorus intake of normal healthy children, calculations were also made of the intake of protein, fat, carbohydrate, calcium, and iron during the period under investigation, which in all cases consisted of four consecutive days. The subjects included 25 children from private homes and 30 from an orphanage, all selected as being in normal physical condition and within 4 per cent of the "commonly accepted standard of weight for height." The ages of the children ranged from 2 years to 5 years 11 months. The calculations were made on the daily consumption of food by each child and averaged for the four days of the experiment.

The amount of food eaten varied greatly for children of the same age and even from day to day for the same child. The average daily caloric intake of the entire group was 1,418 for the boys and 1,363 for the girls and the intake per kilogram of body weight 91 and 88 calories, respectively. The average caloric intake increased with age, but no significant differences were noted in calories per kilogram body weight for the different age groups.

The average daily protein consumption was 44 gm. for the boys and 41 for the girls, with per kilogram intake of 2.79 and 2.66 gm., respectively. With 32 of the children the amount of protein per kilogram body weight was below most of the standards except that of Sherman. There was a slight tendency toward a decrease in protein consumption per kilogram with increase in age. An average of 69.2 per cent of the total protein was derived from animal sources in the children from private homes as compared with 48 per cent in the institution children.

The average fat consumption was 54 gm. daily for the boys and 53 for the girls, with an average per kilogram intake of 3.44 and 3.39 gm., respectively. For the entire group 35 per cent of the total calories came from fat. The

the corresponding age group of the institution children. The average total carbohydrate consumption was 190 gm. daily for the boys and 182 for the girls, with an average per kilogram intake of 12.07 and 11.73 gm., respectively. For the entire group an average of 53 per cent of the calories came from carbohydrate, with an average of 49 per cent for the private home children and 57 per cent for the institution children.

The average figures for mineral consumption for the entire group, the private home group, and the institution group were calcium 0.921, 1.026, and 0.834 gm. daily; phosphorus 0.974, 1.086, and 0.882 gm.; and iron 0.0061, 0.0082, and 0.0044 gm., respectively.

A further study of 8 of the children who were markedly in advance of standards of height and weight for age showed that their total consumption of food was larger than the other children of the same age groups and that this was also true of protein, phosphorus, calcium, and iron. The chief source of calcium and phosphorus in the diet was milk, with cereals ranking next in importance for phosphorus. Cereals and vegetables appeared to be the principal sources of iron, with milk and fruits providing smaller amounts. For the private home children meat and eggs were important sources of iron.

The relation of iron from various sources to nutritional anemia, H. S. MITCHELL and L. SCHMIDT (*Jour. Biol. Chem., 70 (1926), No. 2, pp. 471–486, figs. 3*).—In this study extremely anemic second generation rats on a basal diet of whole milk, supplemented by salts of manganese, fluorine, silicon, aluminum, and iodine in the amounts recommended by Daniels and Hutton (E. S. R., 53, p. 564), were given soon after weaning daily supplements of various iron-containing foods and iron salts in amounts calculated to contain 0.4 mg. of iron. The effect of these iron-containing compounds on blood regeneration was tested by weekly hemoglobin determinations.

As thus tested, molasses, meat, and ovoferrin were ranked as very good in the availability of their iron, egg yolk and spinach good, and raisins and dates uncertain because of incomplete consumption. Of the inorganic sources of iron the readily soluble ferric chloride and ferric ammonium citrate brought about a prompt increase in the hemoglobin count, while the response to the insoluble compounds ferric oxide and ferric carbonate was decidedly slower, more irregular, and less marked. Contrary to the findings of Hart, Steenbock, et al. (E. S. R., 54, p. 293), the presence of chlorophyll did not increase the availability of the iron from the oxide or carbonate.

"In view of these observations it is suggested that a new line of differentiation be drawn as regards availability of iron in the animal organism, namely, soluble v. insoluble rather than merely organic v. inorganic."

Blood regeneration in severe anemia.—V–VII (*Amer. Jour. Physiol., 79 (1927), No. 2, pp. 260–288*).—In these three papers the results are reported of a continuation of the studies on the influence of various types of feeding upon severe secondary anemia produced in dogs by bleeding (E. S. R., 53, p. 866).

V. *Influence of striated and smooth muscle feeding,* G. H. Whipple and F. S. Robscheit-Robbins (pp. 260–270).—The materials tested, arranged in order of increasing potency for hemoglobin production, were beef skeletal muscle, beef stomach, pig heart, beef heart, pig skeletal muscle, pig uterus, and chicken gizzard. The chicken gizzard, which was the purest form of smooth muscle tested, was far superior to the other materials, being almost as active as beef or pig liver. When fed cooked in amounts from 200 to 300 gm. daily, it increased the production of hemoglobin over that of the control period by from 60 to 100 gm. in two weeks.

The favorable results obtained in the dietary treatment of anemia reported in this and previous studies are considered by the authors to point to the

probability that many types of human anemia may be treated to advantage by diet control rather than by other methods, and in this connection the reports of Minot and Murphy (E. S. R., 56, p. 294) are cited. "It is to be hoped that other types of human anemia may be subjected to similar study. One of the difficulties encountered in human and animal experiments is related to appetite and ingestion of requisite amounts of food. Careful preparation and slight modifications of the diet mixtures will do much to overcome these difficulties, and it should be borne in mind that a few grams of any potent food are not sufficient but abundant intake of sufficient calories is a necessity."

VI. *Influence of kidney, chicken and fish livers, and whole fish*, F. S. Robscheit-Robbins and G. H. Whipple (pp. 271–279).—Cooked pig and beef kidney brought about as prompt and extensive regeneration of hemoglobin as did the chicken gizzard of the previous study. Chicken liver proved even more satisfactory, but fish liver was almost inert. Whole fish produced a very slight increase. Broth from the cooked chicken liver was without appreciable effect. The favorable results obtained with kidney, together with its high content of iron as reported by Forbes and Swift (E. S. R., 55, p. 591), are thought to suggest the possibility that the kidney is concerned with pigment conservation and storage.

VII. *Influence of dairy products on hemoglobin production*, G. H. Whipple and F. S. Robscheit-Robbins (pp. 280–288).—The dairy products tested included milk, cream, American cheese, and butter. Milk did not increase the hemoglobin production to the slightest extent. The other dairy products brought about a very slight increase (from 5 to 20 gm. in two weeks). "Whole milk stands at the foot of the class of diet factors which bring about rapid hemoglobin regeneration in severe anemia. . . . Physicians should keep this in mind in diet control of anemia, especially in young children or infants where milk is apt to be the main diet constituent."

The prevention of rickets.—The influence of the routine administration of cod liver oil in the prevention of rickets in infants, M. G. Wilson (*Amer. Jour. Diseases Children*, *31* (*1926*), *No. 5*, *pp. 603–630*, *figs. 5*).—In one preliminary survey and two detailed studies of the effect of the routine administration of cod-liver oil for the prevention of infantile rickets there were no striking differences in the incidence or severity of rickets in infants receiving and not receiving cod-liver oil, and apparently no relation between the degree of rickets observed and the amount of cod-liver oil administered. In those receiving the oil healing of rickets took place more promptly, however, than in those not receiving it.

Rickets was observed in all cases earlier by Röntgen-ray than by clinical examination. In the present studies it was observed in 4 per cent at 1 month and in 23 per cent at 2 months by Röntgen-ray, as compared with a total of 4 per cent at 2 months by clinical examination alone. By the fourth month rickets was present in the majority of the infants under examination, and after 6 months healing rickets was most frequently encountered.

The early age incidence of rickets is thought to indicate the necessity of applying control or preventive measures in the first month, particularly for babies born in the winter. Cod-liver oil would seem to be of greater value for control than prevention.

A tuberculosis survey of extremely underweight children, K. H. K. Wolfe (*Amer. Rev. Tuberc.*, *13* (*1926*), *No. 6*, *pp. 506–523*, *figs. 8*).—While this survey was undertaken primarily to determine the extent of tuberculosis among chronically underweight children in elementary, junior high, and high school classes, the data reported are of interest in pointing to malnutrition as laying the foun-

Of 105 children 15 per cent or more underweight who were given chest examinations, 64 were found to have tuberculosis, sinus, and tonsil infections. Organic heart defects and digestive disturbances were present in a relatively high percentage of the total number of 146 children examined. The group of tuberculous children had a much higher percentage of those who had insufficient sleep and who drank coffee daily, and the nontuberculous suffering from other infections of those who ate an excessive amount of sweets and white bread, with small amounts of vegetables and almost no milk. These observations are thought to point to overfatigue as an important factor in causing latent tuberculosis to become active, and to a causal relationship between a deficiency of minerals and vitamins in the diet and resistance to infection.

TEXTILES AND CLOTHING

A new mechanical method for determining the length of cotton fibers, E. E. CHANDLER (*U. S. Dept. Agr., Bur. Agr. Econ., 1926, pp. 38, figs. 11; abs. in Textile World, 70 (1926), No. 24, p. 51, fig. 1*).—The method described, developed by this Department in cooperation with Clemson College, consists in cutting a middle portion or section from several pulls of cotton and determining the ratio by weight of the two ends to the middle.

A new method for determining the strength of cotton, E. E. CHANDLER (*U. S. Dept. Agr., Bur. Agr. Econ., 1926, pp. 16, figs. 4*).—This preliminary report of experiments in cooperation with Clemson College describes the development of a simple method to determine the strength of cotton fiber.

The action of ammonia on wool, H. E. FARRAR and P. E. KING (*Jour. Textile Inst., 17 (1926), No. 11, pp. T588–T590*).—The action of aqueous and alcoholic ammonia on wool under various conditions of temperature, time, and concentration is described, and a new method for estimating the amount of sulfur on woolen cloth is outlined.

The testing of yarns and fabrics, H. P. CURTIS (*London and New York: Isaac Pitman & Sons, 1926, pp. XII+168, figs. 60*).—This is a practical manual designed for manufacturers, warehousemen, operatives, drapers, laundrymen, and clothiers. Chapters deal with analysis and dissection of woven fabrics, determining warp and weft, ends and picks per inch, identification of fibers, estimation of counts from cloth, examination of cloth, sizing, rayon, silk, color fastness tests, yarn and cloth testing, and watch calculators.

Thread take-up in the seaming of knitted fabrics, H. S. BELL (*Jour. Textile Inst., 17 (1926), No. 11, pp. T583–T587, figs. 4*).—Measurements were recorded at University College, Nottingham, for a typical range of stitches under working conditions of the amount of thread exclusive of waste used in the seaming of knitted fabrics. The work deals with chain stitch, lock stitch, 2 and 3-thread overlock, cup seaming, double chain stitch, double and triple interlock stitch, and flat lock.

The chemistry of dyeing, J. K. WOOD (*London: Gurney & Jackson, 1926, [2. ed.], rev., pp. VII+104*).—A revision of a brief monograph originally issued in 1913 on the chemical composition and properties of the textile fibers, dyes and their properties, and the nature of the dyeing process.

NOTES

Alaska Stations.—Dr. H. W. Alberts, senior agronomist at Sitka, has been appointed director beginning April 1. Dr. C. C. Georgeson is to continue in the service of the station as senior agronomist to complete the results of his 30 years' work.

Arkansas Station.—An appropriation of $150,000 has been made by the legislature for the work of the three substations at Marianna, Hope, and Stuttgart for the ensuing biennium.

Kansas College and Station.—The legislature has appropriated $2,800,632 for the support of the institution, including the branch stations and the extension service, during the biennium beginning July 1. The appropriations include $315,000 for a new heating and power plant, a new item of $40,000 for laboratory equipment and improvements, $45,000 for equipment for the new library, $24,000 for remodeling the old library building for classroom and laboratory uses, $2,000 for the purchase of additional land for use in plant breeding, $89,950 for the support of the four branch stations, and $203,682 for duplicating Federal funds for extension work in agriculture and home economics. The total amount appropriated is $160,732 greater than the regular appropriations made two years ago, but $356,500 less than the amount requested for the ensuing biennium by the State Board of Regents. The principal cuts in the recommendations of the regents were made in the items for salaries, general maintenance, and improvements and repairs, the appropriations for these three items being the same as were made in 1925. As a partial offset to the inadequacy in the amounts of these items, the regents have ordered an increase in the incidental fee paid by students from $15 to $25 a semester for residents of Kansas and from $22.50 to $37 a semester for nonresidents.

A 4-year course in agricultural administration and a 6-year course in general science and veterinary medicine are to be offered beginning with the fall semester. The agricultural adminstration course is designed to provide opportunity for special preparation in the fields of land economics, rural banking, grain industries, agricultural journalism, agricultural engineering, and agricultural education. The 6-year course will provide four years of general science combined with subjects fundamental to veterinary medicine and leading to the B. S. degree, while the remaining two years will be given almost exclusively to professional veterinary subjects and complete the requirements for the degree of doctor of veterinary medicine.

The herbarium of the late B. B. Smyth, at the time of his death in 1919 curator of the Goss Collection at Topeka, consisting of approximately 7,000 sheets, has recently been donated to the college by Mrs. Smyth.

The third annual conference of substation workers was held at Manhattan March 4 and 5. The conference was devoted to a consideration of current problems in wheat production demanding experimental attention, especially the aspects of the wheat production problem resulting from the advent of the combined harvester thresher.

H. B. Walker, head of the department of agricultural engineering, has been given a year's leave of absence to become director of research in mechanical farm equipment with the U. S. Department of Agriculture. R. H. Driftmier will be in charge of agricultural engineering work during the year. V. R.

Hellman, assistant professor of agricultural engineering, has been succeeded by Roy Bainer as instructor and he in turn by E. D. Gordon. R. P. White, assistant plant pathologist, has resigned, effective May 1, to accept a similar position with the New Jersey Stations.

Kentucky University and Station.—The resignations are noted of Nellie A. Gard, assistant professor of home economics, on February 1 and Carrie Lee Hathaway, seed analyst, on March 1. The former has been succeeded by Gertrude Wade and the latter by Jessie Terry. R. E. Proctor has been appointed assistant in farm management beginning February 1.

New Hampshire Station.—The nutrition laboratory for the studies of basal metabolism with livestock has been enlarged to include a section to be devoted to work in human nutrition. Investigations in this project are being started by Mary E. A. Pillsbury in cooperation with Dr. F. G. Benedict, director of the Nutrition Research Laboratory of the Carnegie Institute of Washington.

E. H. Rinear, who specialized in marketing studies at the University of Wisconsin, has been appointed assistant agricultural economist to conduct special studies in marketing.

New Mexico College and Station.—Under legislation signed by President Coolidge March 2, the college is granted public lands aggregating about 55,000 acres for the purpose of conducting "educational, demonstrative, and experimental development with livestock, grazing methods, and range forage plants." The tract is located near Fort Selden in Dona Ana County, and some lands, watering places, and fences on the area are already owned or controlled by the college. The acquisition of the entire area, however, will permit of large scale experiments in range management, including work with range sheep and goats.

On February 1, K. K. Henness, formerly connected with the extension division of the University of Arizona, began work as field investigator under a project dealing with range sheep and goat production in eastern Arizona and western New Mexico. The Bureaus of Agricultural Economics and Animal Industry of the U. S. Department of Agriculture and the Arizona and New Mexico Experiment Stations are cooperating in the project, which is to continue at least three years.

New York State Station.—A new variety of kidney bean, named Geneva Red Kidney and said to surpass in many respects Wells Red Kidney, the standard red kidney bean of New York, has been originated by the plant disease specialist of the station, and is being introduced to bean growers, small quantities of seed being available for testing. The new bean originated from a cross between a white kidney bean of marked vigor and disease resistance, discovered in 1918, and Wells Red Kidney, in an effort to develop a bean more resistant to disease than the latter. Its chief advantages are said to be its greater disease resistance, vigor, and productiveness, an improved habit of growth, and better cooking qualities.

R. B. Dayton, assistant in research (chemistry) has resigned to accept a commercial position. Dr. Bernhard Nebel of the University of Halle is spending six months at the station in a study of its fruit breeding methods. Dr. Nebel is in this country under a fellowship from the International Education Board and will later study citrus fruits at the California Station.

North Dakota Station.—The legislature has appropriated $288,195 for the station for the biennium beginning July 1, an increase from $265,400. A special act was also passed which appropriates $15,000 additional for certification and registration of pure seed. For animal diseases $9,000 is provided, and $15,000 is granted for a greenhouse for work in plant pathology. The appropriation for the substations was materially increased.

Pennsylvania College and Station.—R. G. Bressler, vice dean and director of instruction in the School of Agriculture, resigned February 1, and H. F. Farnsworth, assistant in animal husbandry, effective March 15. Carl A. M. Sorg has been appointed assistant professor of ornamental horticulture, effective September 1.

South Carolina College and Station.—The Pendleton Farmers' Society, organized in 1815, has deposited many of its oldest and most valuable books with the college library, including Gardeners' Dictionary, by Philip Miller, two volumes, published in 1733; Young's Experimental Agriculture, four volumes, and Annals of Agriculture; and Volumes 2 and 3 of the Memoirs of the Philadelphia Society for Promoting Agriculture.

The station has recently acquired approximately 800 acres of land near Columbia in Richland County to be used as the Sand Hill Substation. The soil here is typical of a wide range of Sand Hill soil traversing the Southeast, and extensive experiments will be conducted under the direction of the station.

An agronomy laboratory has just been completed at the agronomy experimental farm. This building provides room for offices, small gins, scales, etc., as well as storage space for seeds and fertilizers.

A station greenhouse is nearing completion. It will be equipped with an automatic heat regulator and temperature control and will be used among other things to facilitate experiments on the influence of temperature on the germination, growth, and development of plants.

Tennessee University.—An act passed by the last legislature authorizes a $2,000,000 bond issue for additional buildings. This will enable certain necessary enlargements at Memphis and Knoxville and the taking over of the Hall-Moody properties at Martin, where it is expected to establish a junior agricultural college.

Wyoming Station.—Dr. C. B. Clevenger, assistant research chemist, has resigned to accept a commercial position in Honduras.

Agricultural College and Model Farm in the Ukraine.—A note in *School and Society* announces that a combined agricultural college and model farm is to be opened in the Ukraine next October. A former monastery on the River Dnieper, about 60 miles from Krivtoyrov, is to be available for the institution. This monastery has been run in recent years as a state farm and contains 7,000 acres of excellent soil and buildings sufficient to house 500 students. The plan is to provide four hours' work daily on the land and four hours in school, with the expectation that the enterprise will thus be self-supporting. The college will be coeducational and self-governing to the extent that students will be represented on the governing board as well as manage their own activities, including a radio transmitting station, a newspaper, etc. Special prominence is to be given to the "mechanization of agriculture" and also to its industrialization by the installation of a cannery and similar equipment. The course will occupy four years, and it is expected that the third and fourth year students will hold classes and give demonstrations throughout the countryside in modern agricultural methods and related questions.

German National Tobacco Research Institute.—Plans have been approved for the early establishment of this institution. A grant of 150,000 marks from the National German Government and 50,000 marks from the State of Baden has been contributed for its construction during 1927. The Baden Chamber of Agriculture has agreed to supply a building site and eight acres for an experimental field, to be located in the chamber's experimental and instruction grounds at Forchheim near Karlsruhe. Among the problems to be studied are those relating to cultural methods, fertilizers, and the introduction of foreign tobacco strains.

Ohara Institute for Agricultural Research.—A recent issue of *Berichte des Ōhara Instituts für Landwirtschaftliche Forschungen* contains a brief illustrated account of this institution, founded in 1914 by Magosaburo Ōhara in commemoration of the Ōhara family and located at Kurashiki, Okayama-Ken, Japan. The institute is supported mainly from the proceeds of the farm, but the deficit as well as emergency expenses, including the acquisition of a library of 40,000 volumes and considerable special equipment, has been made up by Mr. Ōhara. At the present time there are four departments, farm crops and plant genetics, agricultural chemistry and microbiology, entomology, and plant pathology.

North Manchuria Botanical Garden and Museum.—This garden was founded in Harbin in 1924 by the Manchuria Research Society in conjunction with the Manchuria Agricultural Society and is managed jointly by the two societies. One section is allotted to local food plants, another to ornamentals, a third to field and leguminous plants, and a fourth to weeds.

A subsection of the museum of the Manchuria Research Society is devoted to agriculture, including implements, grains, horticultural plants, apiculture, and fiber plants.

New Journals.—*The Journal of Textile Science* is being published monthly, and has absorbed *The Journal of the Leeds University Textile Association*. The initial number contains several technical articles, including Top Analysis; The Testing of Single Yarns; An Investigation into the Nature of British Pedigree Wools, Their Spinning and Their Weaving Qualities; and A Graphic Key to the Study of the Effects of Free Trade, Tariffs, and Preferential and Export Duties on Agriculture and Industry.

Mitteilungen der Gesellschaft für Vorratsschutz E. V. is being issued as an aid to the solution of problems related to storage losses. The initial number contains articles entitled Theory and Practice in the Control of Losses in Trade and Industry, by F. Zacher; Is the Saw-toothed Grain Beetle a Storage Pest? by M. Schmidt; and Destruction of Poles for Power Transmission by the Hausbock (*Hylotrupes bajulus*), by Zillig.

The Proceedings of the Entomological Society of London are to be issued separately from the Transactions of the society. Vol. 1, No. 1, of the proceedings, which will appear in three parts annually, has just been issued. The transactions will continue the former volume number and will appear in two parts annually.

Revista Argentina de Botánica is being issued quarterly, the initial number consisting mainly of an article entitled Floral Heteromorphism in *Solanum atropurpureum* and a description and key to 41 species of Stipa.

Revista de Veterinaria is being published monthly at Saragossa, Spain. It contains both original and translated articles, notes, abstracts, etc.

Prospective Congresses.—On invitation of the American Association of Economic Entomologists and the Entomological Society of America, the Fourth International Congress of Entomology will be held at Ithaca, N. Y., probably in the third week of August, 1928.

Following an invitation from the Netherlands East Indies, the Fourth Pan Pacific Science Congress is to be held in Java in 1929.

EXPERIMENT STATION RECORD

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RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

New conceptions in colloidal chemistry, H. Freundlich (*London: Methuen & Co., 1926, pp. VII+147, [pls. 5], figs. [38]*).—This small volume contains the subject matter of a series of lectures on the development of various aspects of colloidal chemistry delivered in the United States during the summer of 1925. Textbooks by the author on the same subject have been noted previously (E. S. R., 56, p. 201).

Practical colloid chemistry, W. Ostwald, P. Wolski, and A. Kuhn, trans. by I. N. Kugelmass and T. K. Cleveland (*London: Methuen & Co., 1926, pp. XVI+191, figs. 22*).—An English translation of the fourth edition of this laboratory manual of colloid chemistry, the first German edition of which has been noted previously (E. S. R., 44, p. 409).

An introduction to surface chemistry, E. K. Rideal (*Cambridge, Eng.: Univ. Press, 1926, pp. [IX]+336, figs. 46*).—This monograph, the preface of which was contributed by F. G. Donnan, deals with the properties of surfaces and reactions at interfaces from the point of view of the theory of the molecular structure of surfaces, as advanced particularly by W. B. Hardy and by I. Langmuir.

Proceedings of the forty-first annual convention of the Association of Official Agricultural Chemists, 1925, (*Jour. Assoc. Off. Agr. Chem., 9 (1926), Nos. 1, pp. IV+124, pl. 1, fig. 1; 2, pp. VI+125–230, pl. 1, fig. 1; 3, pp. V+231–346, pl. 1; 4, pp. III+347–500+V, pl. 1*).—This is the complete report of the convention held at Washington, D. C., October 26–28, 1925 (E. S. R., 54, p. 98). Abstracts of some of the papers presented are given elsewhere in this section.

Factors affecting the distribution of electrolytes, water, and gases in the animal body, D. D. Van Slyke (*Philadelphia and London: J. B. Lippincott Co., 1926, pp. VII+62, figs. 16*).—These lectures on the general subject of the regulation of neutrality in the organism, which were delivered at Rutgers University under the Luther Laflin Kellogg Foundation, have been assembled as one of the series of monographs on experimental biology founded by J. Loeb.

The composition and characterization of the natural proteins [trans. title], S. P. L. Sørensen (*Compt. Rend. Lab. Carlsberg, 16 (1926), No. 8, pp. 20*).—A critical summary of recent literature on the subject.

Chemical investigation of the amylases and related enzymes, H. C. Sherman (*Carnegie Inst. Wash. Yearbook 25 (1925–26), pp. 332–334*).—This progress report (E. S. R., 55, p. 110) deals chiefly with an investigation of the claims of Willstätter, Waldschmidt-Leitz, and Hesse regarding the separation of amylase and protease through the use of electro-osmotically purified kaolin.

A repetition of their entire process yielded a product with a final activity three or four times that of the original extract, but only about half that of the purified preparation obtained by the author's method. The results of the adsorption experiments are considered, however, to furnish added evidence that pancreatic amylase either is a protein or contains protein as an essential constituent.

Wheat and flour studies.—V, Plasticity of simple flour-in-water suspensions, P. F. SHARP (*Cereal Chem., 3 (1926), No. 1, pp. 40–56, figs. 3*).—This paper includes a theoretical discussion, with references to the original literature, of the difference between viscosity and plasticity, a description of a comparatively simple apparatus devised to determine the plasticity of flour and water suspensions, and data on the use of this apparatus in determining the concentration at which flour and water suspensions become plastic.

Wheat and flour studies.—VI, Effect of yeast fermentation on the proteins of flour, P. F. SHARP and O. M. SCHREINER (*Cereal Chem., 3 (1926), No. 2, pp. 90–101, figs. 2*).—In an effort to explain the effect of yeast upon the imbibitional properties of the glutenin of flour samples, as shown by Sharp and Gortner (E. S. R., 52, p. 12), analyses of a dough containing 4 per cent of yeast were made during the progress of fermentation. No marked changes in the protein of the flour during the progress of fermentation could be detected by these analyses, which included moisture, crude protein, amino nitrogen, potassium sulfate-soluble and alcohol-soluble protein, and H-ion concentration.

Doughs were then prepared containing no yeast, 1 per cent, 2 per cent, and 4 per cent, respectively, and samples of these doughs were taken from time to time for measurements of their flow through a plastometer, using the method and apparatus described by Sharp as noted above. Both the consistency and the yield value of the glutenin suspensions were found to increase, the latter to a more marked extent, with the progress of fermentation.

Chemical composition of okra seed, J. O. HALVERSON and B. NAIMAN (*Jour. Oil and Fat Indus., 3 (1926), No. 11, pp. 386, 387*).—Data are reported from the North Carolina Experiment Station on the composition of six samples of okra seed—two of tall green long pod, two of dwarf thick pod, and two of White Velvet white pod varieties, and of the separate meats and hulls of dwarf okra seed. The average composition of the six samples of whole seed on the moisture-free basis was ash 4.7, calcium 0.261, crude fat 21.72, crude fiber 31.37, and crude protein 27.28 per cent. These values are similar to reported values for cotton seed, the chief difference being the crude protein, which is 6.54 per cent higher in okra seed than in cotton seed.

"The mature seed of the okra plant possesses good feeding value in that it consists of one-fourth protein and one-fifth oil. This plant being prolific and a vigorous grower in the Cotton Belt has possibilities of economic importance due to its high oil content and to the feeding value for animals of the high protein meal remaining after the oil is extracted."

The fatty oils of sweet clover seed.—I, Melilotus albus, B. A. DUNBAR and C. F. WELLS (*Jour. Oil and Fat Indus., 3 (1926), No. 11, pp. 382–385*).—An analysis is reported of the seed of the sweet clover, *M. albus*, produced at Highmore, S. Dak., and of the oil extracted from the seed with ethyl ether in a specially constructed Soxhlet extractor. The proximate composition of the ground seed is moisture 6.58, ether extract 5.26, protein 35.17, crude fiber 11.15, ash 3.46, and nitrogen-free extract 48.38 per cent.

The oil was found to be a drying oil, having a specific gravity at 25° C. of 0.9518 and a refractive index of 1.4838 at the same temperature. Some of the

analytical constants reported are saponification number 203.3, iodine number (Hanus) 142.5, specific Maumené number 108.4, Reichert-Meissl number 3.45, and acetyl value 43.13. Corresponding values for the saturated and unsaturated fatty acids were neutralization number 216.3 and 198.9, iodine value (Hanus) 68.05 and 147.16, and mean molecular weight 259.75 and 282.1, respectively. The oil contained 4.08 per cent of free fatty acids, 3.05 per cent of unsaponifiable matter, 11.11 per cent of glycerol, and 86.90 per cent of total fatty acids.

Negative results were obtained with the Molisch test for carbohydrates, the ferric chloride test for phenol derivatives, and the phenylhydrazine reaction for ketones. The oil is thought to possess commercial value as a substitute for drying oils.

Inactivation of the antirachitic factor in cod-liver oil by ultra-violet irradiation [trans. title], A. ADAM (*Klin. Wchnschr., 5 (1926), No. 36, pp. 1648–1650*).—Attempts to increase the antirachitic activity of cod-liver oil by irradiation in the same manner as cholesterol and other food materials are activated led to the destruction of the antirachitic vitamin already present as tested by the use of the irradiated oil as a preventive and curative measure in rat and infantile rickets. Chemical and physical studies conducted on the irradiated oil are reported, with the following results:

The absorption spectrum for ultra-violet light showed a greater permeability for the irradiated than for the nonirradiated oil. The irradiated oil blackened photographic plates, showed no fluorescence, was more readily emulsified with gum tragacanth, and blackened on heating to 250° C. The viscosity and the surface tension of the oil increased rapidly with irradiation, the iodine number decreased, and the acidity as measured by pH and also by titration increased.

The possible bearing of these changes on the chemical action involved in the inactivation of the oil is discussed, with the final suggestion that the sterols in cod-liver oil become inactivated by saturation.

Synthesis and indicator properties of some new sulfonphthaleins, B. COHEN (*Pub. Health Rpts. [U. S.], 41 (1926), No. 53, pp. 3051–3074, fig. 1*).—This is the complete report on the synthesis and properties of several new sulfonphthalein indicators, five of which were noted in a preliminary report (E. S. R., 48, p. 804). The present report includes a description of the synthesis of the new indicators and of their absorption curves in the visible spectrum, determinations of the apparent dissociation constants, and data on the salt and protein errors.

A new set of buffer solutions with a pH range of 2.2 to 6.0 [trans. title], J. M. KOLTHOFF and J. J. VLEESCHHOUWER (*Biochem. Ztschr., 179 (1926) No. 4–6, pp. 410–413*).—The new series of buffer solutions described is prepared with tenth-molar monocalcium citrate with N/10 hydrochloric acid and N/10 sodium hydroxide or with tenth-molar citric acid and twentieth-molar borax, respectively. The mixtures are recommended as a good substitute for the Clark biphthalic acid-base buffer solutions.

A modification of the Gillespie approximate method of determining hydrogen ion concentration, J. MCCRAE (*Analyst, 51 (1926), No. 603, pp. 287–290, figs. 4*).—An apparatus is described and illustrated for determining the H-ion concentration of solutions by the principle of the Gillespie drop method (E. S. R., 46, p. 110) without having to make a large number of volume and drop measurements.

The device consists essentially of two right-angled triangular glass cells which can be placed together to form a divided rectangular cell over which is fitted a metal cover provided with lateral slots. A sliding holder carrying a small rectangular glass cell rests on the top of the metal cover and can be

moved along this for the color comparison. In use all three cells are filled with the solution to be tested, to which has been added a sufficient amount of the indicator found on trial to be the most appropriate. A few drops of acid are added to one of the triangular cells and a few drops of alkali to the other, and the solution is stirred to insure uniformity of color. After placing the cover on the triangular cells the small cell is moved along until its color matches the color immediately below it.

The nephelometer [trans. title], H. Kleinmann (*Biochem. Ztschr.*, *179 (1926)*, *No 4–6*, *pp. 301–303*, *figs. 2*).—Certain errors in the use of the author's nephelometer (E. S. R., 50, p. 312) have been traced to inequalities in the thickness of the glass. To overcome this the nephelometer tubes are now made of glass not exceeding 2 mm. in thickness. Other slight modifications in the apparatus are described and illustrated.

A new colorimeter for small amounts of liquids (microcolorimeter) [trans. title], H. Kleinmann (*Biochem. Ztschr.*, *179 (1926)*, *No. 4–6*, *pp. 276–286*, *figs. 2*).—A microcolorimeter of the Du Boscq type for use with as small an amount as 1 cc. of the liquid to be examined is described and illustrated by photograph and diagram.

Microcolorimetric nitrogen determination.—Total and rest nitrogen determination in a few drops of blood [trans. title], H. Kleinmann (*Biochem. Ztschr.*, *179 (1926)*, *No. 4–6*, *pp. 287–300*, *figs. 3*).—Detailed directions are given for a micro method for the determination of nitrogen by an adaptation of the Kjeldahl method of ashing the material, distillation of the ammonia with steam, nesslerization, and final colorimetric determination in the microcolorimeter described in the previous paper. It is said to be possible to conduct the determination on 0.002 cc. of blood for total nitrogen and 0.1 cc. for residual nitrogen.

The determination of potassium in the presence and absence of sulphates, M. A. Hamid (*Analyst*, *51 (1926)*, *No. 606*, *pp. 450–453*).—A comparison is reported of the cobaltinitrite and perchloric acid methods of determining potassium, both in the presence and absence of sulfates. Attention is called to the demonstration that the precipitate formed in the cobaltinitrite method has the formula $K_2NaCo(NO_2)_6.H_2O$ instead of $K_3Co(NO_2)_6$ as suggested by some investigators. The data reported indicate that the cobaltinitrite method yields results comparable with those obtained by other methods, and has the further advantage of being satisfactory in the presence of sulfates where the perchlorate method is unsatisfactory.

A method for potash in mixed fertilizers, G. S. Fraps (*Jour. Assoc. Off. Agr. Chem.*, *9 (1926)*, *No. 2*, *pp. 192, 193*).—The method described, which is based on the De Roode method for potash in soils, is said to have the advantage of rendering the phosphoric acid insoluble before the extraction, of avoiding the precipitation with ammonia and ammonium oxalate which may cause absorption of potash, and of not requiring ignition.

On the determination of small quantities of phosphorus in proteins, M. Sørensen (*Compt. Rend. Lab. Carlsberg*, *15 (1925)*, *No. 10*, *pp. 6*).—A critical study of the reliability of various methods of determining phosphorus when applied to materials containing minute quantities of the phosphorus (0.02 to 1 mg.) in considerable quantities of organic matter has led to the adoption of a combination of various known methods essentially as follows:

The protein solution in question is dried in a long-necked Kjeldahl flask and digested carefully with 4 cc. of concentrated sulfuric acid and 4 cc. of concentrated nitric acid, followed if the liquid is not perfectly clear after the nitric acid has boiled away by more nitric acid but no more sulfuric acid.

After the digestion has been completed and the solution cooled, 25 cc. of water and 10 cc. of saturated ammonium nitrate solution are added, the flask is heated on a boiling water bath, 25 cc. of 5 per cent ammonium molybdate solution is added, the heating continued with repeated shaking for 5 minutes, and allowed to stand until the following day. The liquid is then poured off through a Berzelius filter (No. 0, diameter 7 cm.), care being taken to get as little as possible of the precipitate on the filter. This is washed four times with ice-cold water and eight times with ice-cold 50 per cent alcohol, and is then transferred to the Kjeldahl flask by pouring on the filter 5 cc. of 2 N ammonium hydroxide, followed by filling up the funnel three times with water. An accurately measured amount of N/10 sodium hydroxide calculated to be from 3 to 5 cc. in excess of the amount equivalent to the molybdate precipitate is added, together with a few pieces of pumice, and the solution boiled for about an hour or until it has been reduced from about 60 to from 10 to 15 cc.

The excess sodium hydroxide is titrated with N/10 sulfuric acid, from 1 to 2 cc. more of the acid is added, and the solution boiled for 8 or 10 minutes to expel carbon dioxide. After cooling, the sulfuric acid is titrated with N/10 sodium hydroxide, an excess of about 0.5 cc. of the sodium hydroxide is added, and the titration completed after standing for about half an hour. Two or three blank experiments are run with each determination. The total number of cubic centimeters of sodium hydroxide minus that of the blank multiplied by the factor 0.112 gives the amount of phosphorus in milligrams.

A new colorimetric method for the determination of sugar [trans. title], L. Fábián (*Biochem. Ztschr., 179 (1926), No. 1–3, pp. 59–61*).—The new method described depends upon the reducing action of sugar solutions upon a solution of copper hydrogen carbonate and the measurement of the intensity of the color of the solution after the precipitation of cuprous oxide.

A comparison of the Folin-Wu and new Benedict methods for the estimation of blood sugar, A. E. Osterberg and J. Strunk (*Jour. Lab. and Clin. Med., 12 (1926), No. 3, pp. 278–282*).—The authors report, from a comparison of the Benedict modified method of determining blood sugar (E. S. R., 54, p. 10) with the original Folin-Wu method on four blood filtrates alone and with the addition of varying amounts of glucose, that the Benedict method yields results approximately 12 mg. per cent lower than the Folin-Wu procedure, and that the recovery of glucose added to blood filtrates is more satisfactory by the Benedict method.

Detection and determination of lactic acid in the presence of other organic acids, E. K. Nelson (*Jour. Assoc. Off. Agr. Chem., 9 (1926), No. 3, pp. 331–333*).—The method described, which is said to be satisfactory for the detection and determination of lactic acid in the presence of malic, tartaric, citric, acetic, and benzoic acids as in jams, jellies, or preserves, combines certain features of the Kunz method (E. S. R., 13, p. 524) and the Phelps and Palmer method (E. S. R., 36, p. 808). The lactic acid is finally determined as quinine lactate as in the latter method.

The separation of formic acid in food products by distillation with xylene, J. K. Morton and G. C. Spencer (*Jour. Assoc. Off. Agr. Chem., 9 (1926), No. 2, pp. 221–224*).—"The xylene distillation method for separating acetic acid from mixtures is adapted to the separation of formic acid from food products. In the absence of other volatile reducing substances the results obtained compare favorably with the results obtainable by the steam distillation method. The manipulation is simpler and less time is required."

The determination of copper in foodstuffs, L. H. Lampitt, E. B. Hughes, P. Bilham, and C. H. F. Fuller (*Analyst, 51 (1926), No. 604, pp. 327–335*).—This is a critical discussion of various methods of determining copper in food-

stuffs, with the recommendation of a modified ferrocyanide method as the most satisfactory volumetric method and for a gravimetric procedure precipitation with the antiseptic quinosol, followed in case of large amounts of copper by electrolytic precipitation.

Detection of added pepper shells in pepper, E. R. Smith, S. Alfend, and L. C. Mitchell (*Jour. Assoc. Off. Agr. Chem., 9 (1926), No. 3, pp. 333–342*).—From the analysis of 45 authentic samples of different varieties of whole pepper, pepper shells, and pepper siftings it has been determined that the most valuable criteria for detecting the addition of pepper shells to ground pepper are the figures for crude fiber, *d*-glucose, magnesium oxide, the ratio of magnesium oxide to *d*-glucose, and the product of magnesium oxide and crude fiber. By the use of these values it is said to be possible to detect with certainty the addition of 10 per cent or less of shells if the variety of pepper under examination is known. The use of pepper siftings is said to be readily detected by the abnormally high ash content without appreciable changes in the other values.

Method for the determination of acidity of highly colored fruit-type products, C. H. Badger and J. W. Sale (*Jour. Assoc. Off. Agr. Chem., 9 (1926) No. 3, pp. 342–346*).—The method described depends upon the fact that in acidulated solutions containing the permitted coal tar colors soluble in water the color is readily transferred by boiling to woolen samples contained in them. Two of the permitted dyes, yellow A B and yellow O B, are insoluble in water, and erythrosine is precipitated on boiling. The error in the method, which is due chiefly to the difficulty of removing all of the acid from the cloth, is said not to exceed 2 per cent.

The analysis of butter, L. C. Mitchell and S. Alfend (*Jour. Assoc. Off. Agr. Chem., 9 (1926), No. 2, pp. 209–220, fig. 1*).—A critical study of the Official method for determining fat in butter is reported, together with a proposed modification of the method which is said to yield results in close agreement with those obtained by the Official method and to be much more rapid.

The proposed method is the so-called Gooch method modified by the use in place of asbestos of white sand of sufficient fineness to pass through a 100-mesh sieve. The sand is prepared for use by successive extractions with water, concentrated hydrochloric acid, water, 20 per cent sodium hydroxide, water, and concentrated hydrochloric acid, and finally by washing thoroughly with water and igniting. The extraction of the fat is conducted with chloroform, preferably in a simple form of continuous extraction apparatus, which is described and illustrated.

Determination of strychnine in poisoned grains, J. W. Elmore (*Jour. Assoc. Off. Agr. Chem., 9 (1926), No. 2, pp. 224–230*).—In connection with the enforcement of the California economic poison law, a method of determining the percentage of strychnine in the poison baits used in rodent control was developed, the technique of which is described in detail. The method is a modification of one for the assay of nux vomica described in Allen's Commercial Organic Analysis. The technique involves drying the sample at not over 60° C., grinding it to a powder, and after the extraction as in the method for nux vomica clarifying by the addition of a small amount of Karo, extracting with hydrochloric acid, purifying the solution with lead acetate and acetic acid, and finally precipitating the strychnine with saturated picric acid solution.

Starch-making and the manufacture of dextrin, starch sugar, syrup, and sugar colouring, F. Rehwald, trans. by C. Salter (*London: Scott Greenwood & Son, 1926, pp. VIII+264, fig. 93*).—A translation of the fifth revised German edition of this handbook for starch, dextrin, and starch-sugar manufacturers.

The chemistry of organic dyes, P. Castan (*La Chimie des Matières Colorantes Organiques. Paris: Octave Doin, 1926, pp. 456, figs. 2*).—A volume in the series entitled The Library of Chemistry, edited by A. Pictet, this series being a part of the Scientific Encyclopedia published under the direction of Toulouse.

Volatile solvents and thinners used in the paint and varnish industries, N. Heaton (*London: Ernest Benn, 1925, pp. VIII+11-158*).—This handbook on the nature, preparation, and properties of volatile solvents used in the paint and allied industries is one of the series of oil and color chemistry monographs edited by R. S. Morrell. The more than 60 solvents included are classified by chemical composition in eight groups, the general characteristics of each group preceding the description of the individual solvents. The final chapter deals with some of the theoretical considerations involved in the use of solvents.

METEOROLOGY

An aerological survey of the United States, II, W. R. Gregg (*U. S. Mo. Weather Rev. Sup. 26 (1926), pp. V+60, figs. 14*).—This is part 2 of this survey and deals with results of observations by means of pilot balloons. Part 1, dealing with results of observations by means of kites, was noted (E. S. R., 48, p. 15). The data furnished by this survey are primarily of "practical usefulness in connection with aviation," but are considered of value for other theoretical and practical purposes.

Normals of daily temperature for the United States, C. F. Marvin and P. C. Day (*U. S. Mo. Weather Rev. Sup. 25 (1925), pp. II+87, figs. 13*).—Normals for the 46-year period July 3, 1875, to July 2, 1921, are given. "This series of means, unlike any previously used, . . . is practically homogeneous throughout the period of years considered, and the data from all parts of the country are placed upon a strictly comparable basis."

Weather conditions and crops, C. G. Selvig (*Minnesota Sta., Crookston Substa. Rpt. 1925, pp. 11-14*).—Data for precipitation, temperature, killing frosts, and cloudiness at the Northwest Experiment Station at Crookston, Minn., during 1925 are summarized, and general weather and crop conditions are briefly reviewed.

The total precipitation was 23.76 in. as compared with a 10-year average of 18.69 in. The mean annual temperature was 40.3° F. The minimum temperature was −36° February 2, the maximum 95° August 23. The frost-free period extended from May 17 to October 6. The snowfall of the winter 1924–25 was very light, and winterkilling of winter wheat was very severe. Winter rye and alfalfa suffered but little from this cause.

Weather of the season, P. E. Miller (*Minnesota Sta., Morris Substa. Rpt. 1925, pp. 5-8.*)—Observations on precipitation, temperature, and cloudiness at the West Central Experiment Station at Morris, Minn., during 1925 are summarized, and general weather and crop conditions are noted.

The total rainfall for the year was 21.6 in., 3.5 in. lower than the 17-year average. The temperature of the growing season was approximately 2° higher than the normal. "Weather conditions on the whole were favorable for all grain crops except wheat and corn. Early hay crops and the first cutting of alfalfa yielded well. Late hay crops and corn were seriously reduced in yield because of dry weather during the latter part of the growing season."

Meteorological report for 1925, F. E. Hepner (*Wyoming Sta. Rpt. 1926, pp. 184-186*).—Observations at the University of Wyoming, Laramie, on pressure, temperature, precipitation, wind, and cloudiness are summarized as in previous years. The mean pressure for the year was 23.07 in. The maximum

temperature was 89° F. July 14, the minimum −17° December 15. The mean monthly temperature was 42°. The last killing frost in spring occurred May 9, the first in autumn September 20. The annual precipitation was 14.44 in.

Montezuma pyrheliometry, 1920 to 1926, C. G. ABBOT (*U. S. Mo. Weather Rev. Sup. 27 (1926), pp. I+15, fig. 1*).—Pyrheliometric observations made at Montezuma, Chile, during the period named are tabulated, and the conditions under which they were obtained are briefly explained.

Meteorological factors affecting fertility in the sheep, J. E. NICHOLS (*Ztschr. Induktive Abstam. u. Vererbungslehre, 43 (1927), No. 3–4, pp. 313–329; also in [Gt. Brit.] Min. Agr. and Fisheries and Bd. Agr. Scot., Agr. Met. Scheme, Mo. Crop Weather Rpts., 3 (1926), No. 1, pp. 12; abs. in Scot. Jour. Agr., 10 (1927), No. 1, p. 108*).—Tracing the influence of meteorological conditions in flocks of Cheviot and Blackface sheep kept under the same conditions of nutrition and environment over a period of about 14 years, there were found to be significant differences in fertility between the two breeds and a differential breed response to environmental conditions. While temperature conditions may have some effect, the number of rainy days was found to be the most important meteorological factor in influencing yield of lambs and proportion of dry ewes (eild) in both flocks, probably through effects on early postnatal mortality. The amount of rainfall appeared to be of no significance. On the other hand, "a high number of rainy days is associated with low lambs percentage and high eild and vice versa, but while this and other meteorological factors do influence lambs percentage in both breeds, there being differential responses, the reasons for differences in the yield of lambs in the two flocks are due chiefly to inherent breed characteristics."

SOILS—FERTILIZERS

[Soil studies at the Utah Station] (*Utah Sta. Bul. 198 (1926), pp. 65–68*).—Studies of calcium chloride and gypsum to increase the permeability of alkali soils are reported by M. D. Thomas and D. S. Jennings to have shown that calcium chloride yielded some very promising results, while gypsum acted similarly but much more slowly. It was found that the addition of sodium salts has two important effects, namely, (1) the concentration of the soil solution may be increased, producing a medium toxic to plants, and (2) the sodium enters the silicate complexes replacing calcium, magnesium, and potassium, and yields a soil which is more or less impermeable to water and alkaline in reaction when the amount of soluble salt is low enough to be nontoxic. Vapor pressure studies showed that the soil has the power of removing considerable quantities of sodium sulfate and sodium carbonate from solution, but has little or no action on sodium chloride.

Mechanical puddling and freezing of heavy clay soils was found to affect only the larger capillary spaces, whereas repeated treatment of these soils with strong solutions of the salts of mono- and divalent bases and the subsequent washing free of soluble salt produced more deep-seated changes. In wet soils saturation with sodium causes a remarkable state of deflocculation which has a direct bearing on the reclamation possibilities of alkali soils.

[Soil studies at the Washington Station], F. J. SIEVERS ET AL. (*Washington Col. Sta. Bul. 208 (1926), pp. 38–40, 41*).—The progress of studies on the maintenance of organic matter in eastern Washington soils, soil fertility, the fixation and distribution of nitrogen and organic matter by legumes in Palouse silt loams, and on plant composition as influenced by variation in soil type are briefly reported (E. S. R., 54, p. 808).

[Soil studies at the Adams Substation], H. M. WANSER and I. M. INGHAM (*Washington Col. Sta. Bul. 208 (1926), pp. 46–48*).—The progress results of experiments on tillage and soil moisture, permanent fertility, and on soil organic matter maintenance are briefly reported (E. S. R., 54, p. 809).

The outstanding results were that early spring plowing, which is the most common method of tillage, resulted in the second highest percentage of moisture in the soil at the beginning of the crop year. Fall disking, followed by early spring plowing, produced a slightly higher moisture content. The percentage of nitrogen in grain tended to decrease as the plowing was delayed. The same tendency was noticeable from shallow to deep plowing.

Chemical studies of soil and alkali (*Wyoming Sta. Rpt. 1926, p. 173*).—The progress results of these studies are briefly presented. The principal salts found by the method of separating alkali from soil solutions by natural crystallization were the simple sulfates of calcium, sodium, and magnesium. Slightly more nitrogen was found in soil growing alfalfa than in virgin soil.

[Soil and soil fertility studies in India, 1924–25] (*India [Dept. Agr.] Rev. Agr. Oper., 1924–25, pp. 50–57*).—A progress report is presented of work on soils and fertilizers (E. S. R., 54, p. 810).

In nitrogen fixation studies at Pusa it was found that fixation of nitrogen by algæ alone can take place in India in liquid culture media. The considerable increase of fixation shown in soils exposed to light as compared with darkened controls, accompanied by a correspondingly large growth of algae, suggested the independent action of the latter in this respect. Mannite was found to give the greatest increase in growth of Azotobacter and peptone the least of all the substances tried. Up to 30 per cent of moisture the larger the quantity of water in soils the higher was the amount of nitrogen fixed, and fixation and nitrification were higher at 40° C. (104° F.) than at lower temperatures. An increase in nitrogen took place both in the presence and absence of light. When a moistened soil was dried after fixing the highest quantity of nitrogen and was then moistened again, the amount of nitrogen fixed increased for four or five weeks more up to a certain limit. The addition of lime to a soil already containing enough lime did not increase nitrogen fixation but facilitated nitrification.

The loss of nitrogen as ammonia during the fermentation of urine was prevented by the addition of sulfur and appropriate oxidizing bacteria, the resulting ammonium sulfate being readily available as a nitrifiable source of nitrogen.

In Madras sulfur was found to be the most effective of the various chemicals tried for inhibiting the loss of nitrogen from barnyard manure. Laboratory experiments showed that as a rule nitrification in black cotton soil is greater than in red soil. The results from pot culture studies of the availability of organic fertilizers indicated that peanut cake with or without phosphates gives the best results of all, and is even distinctly superior to ammonium sulfate with or without phosphates

A depression of nitrification in red soils treated with oil cake and lime was found in Bengal to occur in the beginning and continued for three weeks, after which nitrification progressed more rapidly in limed than in unlimed soils. After a lapse of about 12 weeks nearly 75 per cent of the added nitrogen was nitrified in limed soils and only 25 per cent in unlimed soils.

At Pusa it was found that the loss of nitrogen as ammonia during the preliminary stages of decomposition of bone meal in soil and in composts could be prevented by the addition of sulfur and appropriate oxidizing bacteria. Pot culture experiments at Madras demonstrated the superior value of the small amount of nitrogen in bone meal.

A successful method of preparing dicalcic phosphate from apatite was developed at Pusa, which involves the solution of the mineral in perchloric acid and the subsequent precipitation of the dissolved phosphoric acid as lime phosphate. The latter was found to contain about 35 per cent phosphoric acid, almost the whole of which is citrate soluble. It was found that by means of composting with sulfur the natural indigenous phosphate in the form of bones can be effectively utilized in place of imported superphosphate. The addition of a small quantity of charcoal to the compost was found to enhance the solubilization.

Pot experiments at Madras with cyanamide and barnyard manure alone and in combination showed that cyanamide alone gave as good results as when used in conjunction with organic manures, the yields in both cases being five times those obtained in the controls. Successive and increasing additions of cyanamide to a clayey soil, however, resulted in a gradual decrease in the yield of grain and an increase in the yield of straw.

Other data are given on the use of gypsum and lime and on the influence of manures on the quality of crops.

[Soil experiments at the Wellcome Tropical Research Laboratories, Khartum, 1925], A. F. Joseph (*Wellcome Trop. Research Labs., Chem. Sect. Pub. 39 (1926), pp. 7–14, 15–20*).—The usual progress report on mechanical and chemical studies of the soils of the Sudan is presented (E. S. R., 53, p. 722).

Investigations on moisture equivalent of soils showed that mixtures of pure clay and clean sand possess moisture equivalents which are a linear function of their composition. Two classes of soil, namely, aeolian and alluvial, were found to differ very greatly with reference to the silt fraction in relation to moisture equivalent, the silt of the aeolian being much more siliceous and presenting a much lower moisture equivalent than that from soils of alluvial origin. It is considered clear that silt fractions differ as much among themselves as clays, and where this fraction forms a considerable proportion of the soil the differences will have to be taken into account and will in some cases assist in explaining unusual moisture equivalents.

Efforts to separate clay into fractions differing in chemical composition or physical properties showed that the range of composition is much smaller than would have been expected from the imbibitional water, and that the process of supercentrifuging either separates the more physically active part of the colloid or alters the structure in some way.

A continuation of the studies of the action of alkalies on clay showed that the amounts of insoluble compounds of clay with base formed in the presence of an excess of the latter are in the order of calcium, barium, potassium, sodium, and ammonium. The total amounts of sodium and calcium hydroxide neutralized were the same. The addition of sodium and calcium chlorides to their respective hydroxides increased the amount of insoluble compounds formed. The most important differences between the behaviors of silica and clay toward alkalies are (1) that, weight for weight, the former possesses a much greater neutralizing power, and (2) that while the sodium and potassium silicates found are almost entirely soluble, in the case of clay, a large proportion of base is found in the solid phase.

Preliminary experiments showed that with the same clay nephelometer readings could be used to measure the strength of the suspension, but that the addition of neutral flocculants did not affect the turbidity even when the amount of electrolyte added was greatly in excess of that required to produce flocculation. The addition of alkalies, however, produced a very marked decrease in turbidity, the magnitude of which was apparently dependent only on the nature of the alkali and not on its concentration.

Clay which had been treated with calcium and sodium salts to bring about saturation showed quite considerable quantities of calcium and sodium introduced by such treatment, the properties of the products differing greatly in imbibitional water content. The sodium clay was much more slowly dialyzed than the calcium clay and never reached the degree of purification attained comparatively easily by the latter. It was also much more easily and rapidly deflocculated than calcium clay.

Data are also presented on the relation between salt content of soils and crop yield, classification of soil organic matter, humus content of good and bad soils, apparent variation of salt content on storage, and other subjects relating to alkali and the movement of irrigation water.

Application of the Robinson method to the determination of clay, E. B. Engle and D. R. Yoder (*Jour. Amer. Soc. Agron., 18 (1926), No. 11, pp. 1016–1025, fig. 1*).—Studies conducted at the Nebraska Experiment Station are reported which showed that the Robinson method for the determination of clay is simple and accurate, more subject to standardization and more rapid than the centrifugal method, leads to more comparable results, and allows more extensive use of clay determinations in soil studies. The accuracy of the results obtained was found to depend more upon the completeness of deflocculation of the soil sample than upon any other feature of technique. The method is not recommended for alkali and highly calcareous soils, due to their tendency to reflocculate on standing.

Report of the sixth annual meeting of the American Soil Survey Association (*Amer. Soil Survey Assoc. Rpt., 7 (1926), pt. 1, pp. 143, figs. 2*).—The proceedings of this meeting contain special papers on Profile Studies of Representative Soils in the Northern Prairie States, by T. D. Rice; Southern Soils, by W. E. Hearn; Some Profiles of Representative Western Soils, by M. H. Lapham; Mapping Soils in New York, by H. G. Lewis; Some Field Problems in Indiana, by W. E. Tharp; Field Problems of the Illinois Soil Survey, by R. S. Smith; Field Work in South Dakota, by W. I. Watkins; Field Work of the Soil Survey in Alberta, by F. A. Wyatt; Problems and Methods of Mapping Alkali Soils, by A. E. Kocher; Soil Maps in the Drafting Room and the Preparation of Copy, by J. W. McKericher and E. M. Eastwood; Some Important Cuban Soils and Their Relation to Agriculture, by H. H. Bennett; The Soils of Haiti, by A. T. Sweet; Classification of Organic Soils, by J. O. Veatch; Some Characteristic Soil Profiles in the North Central States, by M. Baldwin; Observations on Australia Including Soil, Economic, and Social Aspects, by C. F. Shaw; Copying Soil Survey Maps, by T. M. Bushnell; and Map Production, by A. B. Hoen.

Soil survey of Dooly County, Georgia, S. W. Phillips et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1923, pp. III+271–305, fig. 1, map 1*).—This survey, made in cooperation with the Georgia State College of Agriculture, deals with the soils of an area of 258,560 acres in the Coastal Plain of south-central Georgia. The topography is gently rolling to rolling, and the upland ridge land is well drained. The surface over most of the county is marked by ponds, sinks, and depressions, and in the southeastern and east-central parts by poorly drained flats.

The soils of the county are dominantly low in organic matter and are light in color. Including swamp, 21 soil types of 14 series are mapped, of which the Norfolk and Tifton sandy loams cover 19.4 and 19 per cent of the area, respectively.

Soil survey of Dickson County, Tennessee, J. A. Kerr et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1923, pp. III+307–329, pls. 3, fig. 1, map 1*).—This survey, made in cooperation with the Tennessee Geological Sur-

vey, deals with the soils of an area of 316,800 acres lying in the Highland Rim in north-central Tennessee. The county is predominantly hilly, consisting of dissected plateaus, with smooth land only on the ridges.

The soils of the county are typically deeply weathered, with the content of soluble minerals reduced by leaching. The formations are mainly of the lower Carboniferous. The higher formations are predominantly of deeply weathered clay and chert rock. The lower formations are largely limestone and calcareous shales. Including rough stony land and mine diggings, 14 soil types of 8 series are mapped, of which the Baxter gravelly silt loam and the Dickson silt loam cover 53.5 and 20.4 per cent of the area, respectively.

Study of the marsh lands of the north coast of Porto Rico, R. Fernández García (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt., 1925, p. 113; also in Spanish ed., pp. 118, 119*).—Pot studies of marsh soils are reported to have indicated that the high salt tolerance of cane plants is probably due to the antagonistic action of the high content of organic matter.

Alkali tolerance of plants considered as a phenomenon of adaptation, J. F. Breazeale (*Arizona Sta. Tech. Bul. 11 (1926), pp. 237–256, figs. 4*).—Studies are reported the results of which indicate that the limit of endurance of a plant for alkali salts is apparently determined by the amount of alkali that is required to kill the root enzymes concerned with growth. There appears to be a definite order of toxicity of alkali salts, and the position of each salt in this order depends upon the number of units of time that the plant has come into contact with the salt during its period of adaptation.

The presence of calcium, even in minute amounts, enormously increases the tolerance of wheat seedlings for sodium chloride and other alkalis. Plants are able to utilize calcium at one period, and this calcium may be effective in overcoming alkali at a later period. Plants may be inoculated against alkali with calcium.

Soil potassium, J. W. Ames (*Ohio Sta. Bimo. Bul., 12 (1927), No. 1, pp. 14–18*).—Data are summarized from a study of the availability of soil potassium as indicated by crop yields and soil analyses. It is estimated that the amount of potassium at the disposal of a crop during its growth represents a comparatively small proportion of the total reserve supply. Applications of calcium sulfate, ammonium sulfate, and sodium nitrate appeared to slightly increase the solubility of soil potassium in most of the soils experimented with.

Studies on some obligate thermophilic bacteria from soil, W. A. Feirer (*Soil Sci., 23 (1927), No. 1, pp. 47–56*).—Studies conducted at Johns Hopkins University are reported in which the biological and cultural activities of 10 aerobic, spore-forming, motile, obligate thermophiles are described. The optimum temperature for growth was found to fall between 50 and 60° C. Growth does not take place below 40° and ceases when the temperature is raised to 80°. The thermal death point for a definite concentration of spores varied with each species. The limits lie between 125 and 155° for 15 minutes. One aerobic obligate thermophile was found which exhibits proteolytic action. The cultures are not pathogenic for guinea pigs.

Bacterial activities in an orchard soil, R. H. Walker (*Iowa Acad. Sci. Proc., 32 (1925), pp. 77–80, fig. 1*).—Studies conducted at the Iowa Experiment Station are reported from which the conclusion is drawn that the nitrogen oxidizing power of a soil as determined by its average nitrate content throughout a long period of incubation, accompanied by knowledge of its physical and chemical nature, will serve as a criterion of its crop-producing power.

The occurrence of yeasts in soil, R. L. Starkey and A. T. Henrici (*Soil Sci., 23 (1927), No. 1, pp. 33–45, figs. 12*).—Studies conducted at the University of Minnesota are reported in which yeasts were found in small numbers in 39

out of 87 soil samples. There was no correlation between the occurrence of yeasts and the type of soil, the nature of the crop, or the season of the year. They were found in such small numbers and were so haphazard in distribution as to indicate that they play no important part in soil transformations. Forty-nine strains isolated fell naturally into 12 groups or species.

The viability of legume bacteria on stored inoculated seed, A. G. Lochhead (*Canada Expt. Farms, Div. Bact. Rpt. 1925, pp. 7-9*).—The preliminary results of a series of experiments in which alfalfa and red clover seed were inoculated with cultures of the legume organism and kept for different periods of time under various storage conditions before planting are reported.

Storage in the barn was least favorable, indicating that alternate freezing and thawing temperatures work adversely. The moist, even cold of a refrigerator appeared to be somewhat favorable.

Tests with "Soil Vita" and "Vitamite," A. G. Lochhead (*Canada Expt. Farms, Div. Bact. Rpt. 1925, pp. 16-19*).—Laboratory and greenhouse studies with these materials are briefly reported which indicate that so-called Soil Vita is of no practical benefit. In the case of Vitamite an apparent attempt has been made to include nitrifying organisms, Azotobacter, and the nodule organism, but the opinion is expressed that it is of practical value only so far as it is a legume culture.

Some factors in greenhouse soil sterilization, A. G. Newhall (*Ohio Sta. Bimo. Bul., 12 (1927), No. 1, pp. 21-25, fig. 1*).—Studies are reported in which variations of 40° F. or more were often found between points 6 in. apart but at the same depth in greenhouse soils after steaming for from 1 to 3 hours. The highest soil temperatures at the lowest depths were attained in the driest (26 per cent) sandy soils. Conversely, the poorest steam penetration was in the wettest clay soils (60 per cent moisture).

The results emphasized the importance of thoroughly loosening the soil and of breaking up all the lumps before sterilizing. Under strictly comparable conditions side by side in a heavy clay soil the harrow method proved much less effective than the pan. In one trial on a heavy, wet clay, doubling the time of application of the pan from 1.25 to 2.5 hours increased the depth of steam penetration nearly 50 per cent.

Future trends in soil conservation, J. G. Lipman (*Indus. and Engin. Chem., 18 (1926), No. 10, pp. 1034-1040*).—This is a contribution from the New Jersey Experiment Stations presenting statistical data bearing on the subject.

Soil fertility and soil management experiments, C. G. Selvig (*Minnesota Sta., Crookston Substa. Rpt. 1925, pp. 36-44*).—The progress results of experiments on the effect of continuous cropping of small grains without fertilization and a 4-year rotation without fertilization, phosphating and manuring, rate of manuring, the use of sweet clover for soil improvement, and on straw utilization are briefly reported (E. S. R., 55, p. 320).

[Soil fertility studies at the Morris, Minn., Substation], P. E. Miller (*Minnesota Sta., Morris Substa. Rpt. 1925, pp. 9-22*).—The progress results of studies on phosphate and manuring rotations, rates of manuring, and on the use of wheat straw and corn stover as fertilizers are briefly reported.

[Soil studies at the Prosser Irrigation Substation], H. P. Singleton (*Washington Col. Sta. Bul. 208 (1926), pp. 58, 59*).—The progress results of studies on general soil fertility and on the general uses of sulfur and gypsum as fertilizers are briefly reported. It was found that the slight increases due to sulfur and gypsum during the time the experiment has been under way are insufficient to warrant the application of either to alfalfa on the fine sandy loam soils of the Yakima Valley.

Observations of some biological activities in manure composts, A. J. Englehorn (*Iowa Acad. Sci. Proc., 32 (1925), pp. 85–94*).—Studies conducted at the Iowa Experiment Station are reported which showed that aerobic bacteria are quite active in normal manure composts, especially if those composts are kept at one-half saturation. Sulfur in a manure compost was found to have a depressing effect on the numbers of bacteria due to the acid reaction produced. The presence of orthoclase, and especially the presence of raw rock phosphate, seemed to have a stimulating effect upon the numbers of bacteria. The activities of fungi in compost heaps were found to be markedly depressed by a moisture content of 150 per cent. The presence of sulfur had a stimulating effect on the growth of fungi, while the presence of orthoclase apparently had a depressing effect.

Activated sludge: Its production, composition, and value as a fertilizer, O. J. Noer (*Jour. Amer. Soc. Agron., 18 (1926), No. 11, pp. 953–962*).—Studies conducted at the Wisconsin Experiment Station showed that water-carriage methods of sewage disposal result in enormous losses of nitrogen, phosphoric acid, and potash. The activated sludge process of sewage purification produces a sludge of high nitrogen and phosphoric acid content. Dried activated sludge contains from 4.75 to 6.5 per cent of nitrogen and from 2.3 to 4 per cent of phosphoric acid.

In pot tests in the greenhouse with oats activated sludge as a source of nitrogen proved about equal to cottonseed meal and fertilizer tankage and was considerably better than digested leather.

Field trials with cabbage, tomatoes, corn, and potatoes indicated that activated sludge is a satisfactory source of organic nitrogen for use in mixed fertilizers. Activated sludge was found to exert a favorable influence upon the mechanical condition of mixed fertilizers, helping to prevent setting of the mixtures, making uniform distribution easier, and reducing the danger of injury to the young sprout.

The action of ammonium sulfate and ammonium nitrate on acid sand soils [trans. title], D. Meyer (*Mitt. Deut. Landw. Gesell., 41 (1926), No. 36, pp. 740–742*).—Experiments conducted by the Agricultural Board of Breslau are reported which showed that ammonium sulfate is unfit as a nitrogenous fertilizer for strongly exchangeable light soils with a low humus content, and that sodium and calcium nitrates are best used for this purpose.

Commercial fertilizers, O. S. Roberts et al. (*Indiana Sta. Bul. 301 (1926), pp. 69, fig. 1*).—Guaranties and actual analyses of 1,442 samples of fertilizers and fertilizer materials collected for inspection in Indiana during 1925 are reported.

Inspection of commercial fertilizers for the season of 1926, H. D. Haskins, L. S. Walker, and M. W. Goodwin (*Massachusetts Sta. Control Ser. Bul. 37 (1926), pp. 40*).—Guaranties and actual analyses of samples of fertilizers and fertilizer materials, representing 541 brands, collected for inspection in Massachusetts during 1926, are presented and discussed.

Analyses of commercial fertilizers, fertilizer supplies, and home mixtures for 1926, C. S. Cathcart et al. (*New Jersey Stas. Bul. 440 (1926), pp. 89, fig. 1*).—Actual analyses, and in some cases guaranties, of 244 samples of fertilizer materials, 27 home mixtures, 436 brands of commercial complete fertilizers, 3 brands containing phosphoric acid and potash, and 71 duplicate samples collected for inspection in New Jersey during 1926 are reported and discussed.

AGRICULTURAL BOTANY

Intermediate products in the metabolism of higher plants [trans. title], G. KLEIN (*Naturwissenschaften, 13* (*1925*), *No. 2, pp. 21–24*).—Chiefly, a systematic review is given of hypotheses, researches, findings, and interpretations regarding carbon dioxide and nitrogen in assimilation and respiration.

Formation and distribution of inulin in stems of Jerusalem artichoke [trans. title], H. COLIN (*Rev. Gén. Bot., 37* (*1925*), *No. 435, pp. 97–101*).—The inulin content of Jerusalem artichoke is given in tabular form as determined early in August and about the middle of October at the top, middle, and base of the stem in bark, wood, and pith.

Physiological study of two varieties of Ipomoea batatas, G. R. JOHNSTONE (*Bot. Gaz., 80* (*1925*), *No. 2, pp. 145–167, figs. 4*).—Sweet potatoes, of the varieties Porto Rico and Triumph, increase their respiration rate from the date of harvest to a maximum, after which the rate falls to a nearly constant level. Cured sweet potatoes do not reach so high a level of respiration. Increase of respiration as a result of injury of the cortical layer is due rather to the facilitated gas exchange than to direct wound stimulation.

Curing sweet potatoes under carefully controlled conditions does not greatly reduce the moisture content. The variety Porto Rico shows more carbon dioxide than Triumph in the intercellular spaces. Respiration in both varieties responds to temperature rise between 15 and 25° C. in much the same way as between 25 and 35°, Porto Rico respiring, however, more than does Triumph.

Complete dormancy requires a temperature of not over 25° (77° F.). The H-ion concentrations of the expressed juices are slightly acid and about the same for the two varieties. Moisture and catalase activity are higher in Porto Rico. This variety shows also both laccase and peroxidase, which appear to be important in connection with discoloration on exposure to air. Enzyme behavior is indicated. A physiological distinction of the two varieties is evident. Porto Rico shows greater respiratory activity, greater enzymatic activity, and a higher moisture content.

Salt requirements of wheat at different growth phases, W. F. GERICKE (*Bot. Gaz., 80* (*1925*), *No. 4, pp. 410–425, figs. 10*).—Further but not yet complete presentation is made of the results of work previously in part reported (E. S. R., 52, p. 426). The plan of altering or renewing the medium in which wheat was grown at different developmental stages of the plant was continued.

The maximum development among all the cultures was shown by plants grown four weeks in a complete solution and then transferred to media lacking phosphorus for 104 days. Complete nutrient solution not renewed gave better results than did complete nutrient solution renewed three times during growth. Supra-optimal exposure of cultures to complete nutrient solution of plants transferred to media lacking potassium, magnesium, phosphorus, or sulfur prevented maximum development. The effect of excess was greatest in case of phosphorus and least in sulfur.

Iron and isolated nutrition [trans. title], SIDORINE (*Rev. Gén. Bot., 37* (*1925*), *No. 440, pp. 337–359, fig. 1*).—Development along lines similar to those of previous studies (E. S. R., 36, p. 633) is outlined. Partial absorption of iron and of sulfur is dependent upon three conditions, namely, structure of the vascular system, peculiarities in the circulation of liquids in the vascular system, and differences in the assimilation rates of iron and sulfur.

The enzymes of Stereum purpureum, J. K. MAYO (*New Phytol., 24* (*1925*), *No. 3, pp. 162–171*).—A survey has been made of the enzymes in *S. purpureum*, employing both fructifications and pure-culture mycelium, and the active extracts have been prepared from moist living tissues. Tests were made for

diastase, inulase, glycogenase, invertase, raffinase, maltase, emulsin, pectinase, protease, tyrosinase, oxidase, and reductase. Positive results were obtained for diastase, inulase, glycogenase, invertase, raffinase, emulsin, pectinase, tyrosinase, and oxidase.

The pectinase of Sclerotinia cinerea, G. W. Muhleman (*Biol. Gaz., 80 (1925), No. 3, pp. 325–330*).—Methods are described of growing *S. cinerea* on different media, and it is stated that one growth of the fungus on prune juice seems to unfit this medium for growing further crops. Methods of preparing culture media which give maximum growth are described, as well as three methods of preparing an active pectinase solution.

S. cinerea does not excrete pectinase into the culture media. It is claimed to have been shown that the color of the felts of *S. cinerea* furnishes a good index of the activity of the pectinase solution which may be prepared.

An injurious factor affecting the seeds of Phaseolus vulgaris soaked in water, P. Tilford, C. F. Abel, and R. P. Hibbard (*Mich. Acad. Sci., Arts, and Letters, Papers, 4 (1924), pt. 1, pp. 345–356, fig. 1*).—Seeds of *P. vulgaris* under certain conditions, as soaking in stagnant water, rot without germinating. It is stated that bacterial products kill or weaken the embryo, and that soaking alone is not the injurious factor. Disinfected beans free from organisms germinate as high as 87 per cent even after prolonged soaking in running water at 20° C. (68° F.). Disinfected clean seeds soaked under sterile conditions germinate as high as 54 per cent at the end of 48 hours, and are capable of germination after 126 hours. Disinfected seeds soaked in sterile distilled water and vigorously aerated germinated as high as 97 per cent even after three days under water.

Comparative morphology of cytoplasm and chromatin, C. J. Chamberlain (*Bot. Gaz., 80 (1925), No. 2, pp. 203–212, pl. 1, figs. 3*).—"It seems apparent that both cytoplasm and chromatin are vacuolated and of essentially the same structure."

Continuous respiration studies of dormant seeds of Xanthium, J. Ota (*Bot. Gaz., 80 (1925), No. 3, pp. 288–299, figs. 4*).—A study was made of the respiration behavior of the upper seeds of Xanthium during the long period necessary to their germination. The experiments did not run long enough to indicate the natural rate of carbon loss from respiration under natural conditions. Respiratory activity and catalase activity run parallel throughout the period of dormancy of these seeds.

Recent researches on root respiration: Variations in respiratory quotient during development [trans. title], R. Cerighelli (*Rev. Gén. Bot., 37 (1925), Nos. 435, pp. 102–112; 436, pp. 157–166*).—Traumatism exercises a variable influence on the respiratory quotient, $\frac{CO_2}{O_2}$, which tends to approach unity. Temperature, at least between 12 and 24° C., influences the respiratory quotient only in case the roots, which are fleshy, are rich in reserve material. The value of the respiratory quotient is in close relation with the quantity of reserve material contained in the root. At the beginning of their development the roots usually show a respiratory quotient less than unity. They are at that time poor in reserve material, which they tend to give up rapidly. Roots in annual plants, which are poor in reserve material, have during their whole development a respiratory quotient less than unity. Roots which accumulate reserve material show, on the contrary, at any given stage of their development a quotient higher than unity.

Growth and permeability of century-old cells, D. T. MacDougal (*Amer. Nat., 60 (1926), No. 670, pp. 393–415, figs. 10*).—This paper deals with properties of parenchymatous and medullary cells of the tree cactus (*Carnegiea gigantea*),

which may persist and show activity individually during the century or more of the life of the plant.

Great numbers of parenchymatous cells of all ages are transformed into vascular bundles forming strands connecting with the woody cylinder. The estimated rate of enlargement of medullary cells is greater in the second than in the first half century, following the initial distention. Growth occurs within 150 days annually. Environmental conditions are favorable to activity except for a few periods of a few hours duration of low temperature each year. The abundant pentosans or mucilages diminish with age, while glucose and silica crystals increase. Plasmatic layers shrink and tend to granulate with age. Nuclei change but little. Cell walls thicken. H-ion concentration varies only between pH 5.3 and 5.7. Fatty substances, which are abundant in young cells, give place to starch. Immersion of young cells in acid or alkaline solutions increases permeability and diminishes water-holding capacity. Such immersion of old cells in graded concentrations is followed by maximum swelling in acid solutions at pH 3.0 to 3.5, and a secondary maximum in alkali at pH 9.0 to 11.0. Such nodes have been attributed to the influence of isoelectric regions of proteins in Opuntia.

The effect of light of different wave-lengths on the rate of reproduction of Volvox aureus and Closterium acerosum, A. B. Klugh (*New Phytol., 24 (1925), No. 3, pp. 186–190, figs. 2*).—"Five colonies of *V. aureus* were placed respectively in red, green, and blue light and their rate of reproduction was ascertained, and five individuals of *C. acerosum* were treated in the same way. If the rate of reproduction be taken as a criterion of photosynthetic activity, then photosynthesis is a wave-length phenomenon, red being most efficient, blue much less so, and green inefficient."

Virescence in Delphinium, R. R. Gates and W. R. I. Cook (*New Phytol., 24 (1925), No. 3, pp. 172–179, pl. 1*).—A study was made of virescent inflorescence of Delphinium, which is described. This case is compared with other records of virescence and peloria, and particularly with various instances in which genetic experiments have been made. It is pointed out that many different kinds of change are included under the term "virescence," and that the same teratological condition may appear as the result of a germinal change or as an externally impressed modification.

The mitogenetic rays, A. Gurwitch (*Bot. Gaz., 80 (1925), No. 2, pp. 224–226, fig. 1*).—The author claims to have demonstrated previously the possibility of inducing increase of mitosis in onion root tips through the proximity of similar root tips over a distance of 2 mm. Recent facts are said to have confirmed the existence of a factor, here called mitogenetic, and to have given some idea as to its nature.

Heteroinduction from a Helianthus root tip to an onion root is said to be possible. The induction is effected through water as well as through air. No apparent decrease of effectiveness is caused by distance so far as tested (up to 38 mm.). The effects of the induction are decreased, but not suspended, by the interposition of a glass cover slip. A glass plate 30 μ in thickness gives no sensible reducton. Considerable dispersion of the assumed ray beam is said to be caused by the interposition of a thin layer of plant tissue (onion skin). The ray beam apparently does not undergo diffraction when passed through a slit 30 μ in width. Preliminary experiments with the photographic plate have given only negative results.

Sexual dimorphism in Mercurialis annua [trans. title], G. Souville (*Rev. Gén. Bot., 37 (1925), No. 434, pp. 49–62*).—It is claimed that in *M. annua* morphological dimorphism is evident and physiological dimorphism probable. The evidences are summarized.

Twining in darkness [trans. title], E. C. Teodoresco (*Rev. Gén. Bot., 37 (1925), Nos. 437, pp. 212–232, figs. 14; 438, pp. 261–278, figs. 16; 439, p. 303–320, figs. 13; 440, pp. 360–368, figs. 6*).—Twining movement in darkness was studied in 14 different plants, which are dealt with separately.

Effect of lightning on trunk of *Platanus occidentalis*, J. H. Schaffner (*Bot. Gaz., 80 (1925), No. 2, pp. 226, 227, fig. 1*).—In the spring of 1924 a large sycamore tree was struck by lightning, which removed some of the outer bark without visibly tearing or splitting the trunk or branches. At the opening of the growing period the trunk began to develop numerous buds all the way from the branches of the large crown to the ground, both on the lightning paths and on the undisturbed part of the bark, more than 200 twigs in all. It is thought that this may indicate methods of inducing active growth or rejuvenation of plant tissues which have been differentiated into a condition of stability.

Bacteriophagy, H. von Preisz (*Die Bakteriophagie. Jena: Gustav Fischer, 1925, pp. [3]+110, pls. 3; rev. in Naturwissenschaften, 13 (1925), No. 20, pp. 438, 439*).—This book, based principally on the author's own researches, presents in 14 sections the various phases of the phenomenon designated as bacteriophagy. The author's conception of the assumed agent apparently does not differ greatly from that of D'Herelle (E. S. R., 48, p. 675).

GENETICS

Heritable characters of maize, XXV–XXVIII (*Jour. Heredity, 17 (1926), Nos. 8, pp. 300–306, figs. 3; 9, pp. 326–329, figs. 2; 18 (1927), No. 1, pp. 41–44, fig. 1; 17 (1926), No. 11, pp. 405–411, figs. 4*).—Four more parts of this series (E. S. R., 54, p. 629) are given.

XXV, *Piebald seedlings*, M. Demerec.—This states that piebald corn seedlings are characterized by the usually large, irregular, white spots on their leaves. These spots may remain until maturity or disappear with age. In inheritance studies at Cornell University involving 6 different lines of piebald seedlings, 4 genetically different factors for piebalds were found, $Pb_1\ pb_1$ and $Pb_4\ pb_4$ being simple Mendelian recessives and $Pb_2\ pb_2$ and $Pb_3\ pb_3$ duplicate genes. Linkage tests indicated that piebald 1 is not linked with *R r, Su su, Lg lg, Y y,* and *D d* factors; piebald 2 and 3 are not linked with *Y y;* and piebald 4 is not linked with *Wx wx, Su su, Lg lg, Y y,* and *Gl gl* factors

XXVI. *Concave*, J. B. Wentz.—A defective kernel type termed "concave" (*cv*), in this contribution from Iowa State College, somewhat resembles sugary corn but is more shrunken and lacks the glassy or translucent appearance of sugary seeds. The crown and the side of the seed as well present concave surfaces, and special care seems necessary in germination. Concave seeds were relatively high in sugar and low in starch. This defective is evidently caused by some factor which interferes with starch formation similar to the situation in sugary corn. Inheritance data suggested that concave is due to a single factor.

XXVII. *Colored scuttellum*, G. F. Sprague.—From the ratios obtained in the investigations reported from the U. S. D. A. Bureau of Plant Industry it appeared that at least three factors are involved in the production of scutellum color (in Blue Flour corn) which are similar in their interaction to the *A, C,* and *R* factors for aleurone color (E. S. R., 40, p. 436). At least one and possibly two factors different from these three may also be involved in producing scutellum color.

XXVIII. *Barren-sterile*, C. M. Woodworth.—Barren-sterile, a corn type found in several lines at the Illinois Experiment Station, bears no tassel and in most cases both cob and silk are absent. Barren-sterile plants occurring in selfed lines are much weaker and shorter and the stalks more slender than normal plants in the same lines, while in crosses between certain of

these lines barren-steriles appeared with as much vegetative vigor as any of the normals. Plants exhibiting this type of sterility are very susceptible to corn smut, and the root system is very weak or poorly developed. Although barren-sterile behaved as a simple Mendelian recessive, the appearance of intermediate types in hybrid progenies suggested that the inheritance of the barren-sterile condition is more complex than is indicated by the simple 3 : 1 ratio obtained.

Factors for color of aleurone and endosperm in maize, H. K. Hayes and H. E. Brewbaker (*Jour. Amer. Soc. Agron., 18 (1926), No. 9, pp. 761–767*).—Genetic studies with corn at the Minnesota Experiment Station gave results indicating a linkage of the *Pr* factor with the *R* factor in linkage group II. One of two yellow endosperm types differing from the usual yellow color was somewhat darker than pale yellow and the other a very pale yellow endosperm. The factors conditioning the development of these endosperm colors appeared to be located in chromosome VIII.

A cytological study of two types of variegated pericarp in maize, F. R. Randolph (*New York Cornell Sta. Mem. 102 (1926), pp. 14, pls. 2, figs. 4*).—Study was made of the morphology of the kernel and pistil, location of pigment, development of the epidermis, and color and structure of glumes of sporophytic variations in color, near self and dark crown, occurring in corn strains producing ears with kernels having variegated or striped pericarp. In general the supposed morphological foundation of the hypothesis, as stated by Emerson (E. S. R., 37, p. 737), that mutations occurring in epidermal and subepidermal tissues have produced, by causing the formation of pigments in the two distinct tissues, the dark crown and near self types kernels, respectively, has been found to be insecure, i. e., the color is not limited to the epidermis in one case and to subepidermal tissue in the other.

Inheritance of carbohydrates and fat in crosses of dent and sweet corn, E. W. Lindstrom and F. Gerhardt (*Iowa Sta. Research Bul. 98 (1926), pp. 257–277*).—The inheritance of chemical characters in corn kernels was studied with the F_1 and F_2 of reciprocal hybrids between white and yellow dent and white and yellow sweet corns. Besides the observations noted earlier from other sources (E. S. R., 55, p. 526; 56, p. 29) it was noted that pollen mixtures did not consistently differentiate quantitatively the carbohydrate differences between the *SSS* and *SSs* genotypes borne on the same ear. While no consistent correlation or linkage was demonstrated between yellow and white endosperm color and sugar or starch values, some evidence of a very slight linkage between endosperm color and fat percentage was found. The inheritance of fat or oil content proved to be closely associated with the carbohydrate situation, high fat values being linked with high sugar percentage and vice versa. No evidence appeared of a cumulative effect of any fat values, dependent on the endosperm factors in the triple fusion of nuclei.

Method now employed in testing F_1 corn hybrids at the Cornell University Agricultural Experiment Station, R. G. Wiggans (*Jour. Amer. Soc. Agron., 18 (1926), No. 9, pp. 794–798*).—Methods of testing F_1 corn hybrids and of interpreting the results are outlined.

Correlated inheritance of quantitative and qualitative characters in oats, K. S. Quisenberry (*West Virginia Sta. Bul. 202 (1926), pp. 55, figs. 7*).—The inheritance of length of grain and other differential characters was studied in a cross between Sparrowbill and Victor oats. The Victor had a length of the primary grain averaging 16.4 mm., black grain color, and open panicle, and each primary grain bore a rather strong, black, twisted, geniculate awn. Sparrowbill had a mean grain length of 11.5 mm., white grain and side panicle, and no or few grains were awned. A sample of 10 grains selected from all

parts of the Victor panicle gave about as accurate measure of grain length for the panicle as did all of the grains therein. Grains at the panicle tip were found longer than at the base. Poor soil did not shorten grain length much, whereas height and yield of plant were reduced greatly, showing that grain length is less variable than such characters as plant yield and height.

The F_1 was intermediate for grain length, although tending to approach that of Victor. The variability for grain length in F_2 greatly exceeded those for either parent, ranging between their lengths. From a total of 150 F_3 families, two were recovered with a mean grain length as short as Sparrowbill and four with a mean length as long as Victor. Lines apparently homozygous for grain of intermediate length were found between these two extremes. The results seemed explainable by assuming that the parents differ by at least three main factors or groups of factors for grain length.

Color of grain was controlled by a single factor pair, black being dominant and panicle type by two duplicate factors, one or both present in the dominant condition giving open panicles. Inheritance of awns, more complex in nature, could not be explained by a single factor difference. No linkage was found between the factor for grain color and any factors for grain length. A factor or group of factors for grain length seemed probably linked with each factor for panicle type. At least one factor for awns appeared to be linked with a factor or factors for grain length, and linkage also existed between a factor for panicle type and one for awns. Color of grain and panicle type were not associated, and there was little or no relation between color and awns. The data indicated a linkage group containing a factor for color and possibly one for awns, a second group containing a factor for panicle type and a factor or factor group for grain length and awns, respectively, and a third group containing a factor for panicle type and a factor or factors for grain length.

Correlated inheritance in wheat, G. Stewart (*Jour. Agr. Research* [*U. S.*], *33* (*1926*), *No. 12*, *pp. 1163–1192*, *figs. 4*).—A varietal cross made at the Utah Experiment Station, Dicklow × Sevier wheat, gave rise in subsequent generations to lines more compact of spike, more lax than the parents, outyielding the better parent, or exhibiting resistance to many forms of *Puccinia graminis tritici*. These results led to a genetic study of spike density, awns, and other characters in a cross between a pure line of Federation and one of Sevier wheat. Federation was awnless, intermediate in spike density, slightly square-headed, and had short culms, while Sevier was awned, slightly denser than Federation, not square-headed, and had long culms. The subsequent behavior into F_3 is described.

The F_2 genotypes as classified by the F_3 breeding behavior rather highly substantiated the presence of two factors for awns, both in the same chromosome, with crossing-over to the extent of about 35 per cent. One major factor and a series of minor factors appeared to be involved in the inheritance of spike density in the cross. The ratio of square-headedness was found to be distinctly different in the two parents, and the ranges in the individual rows of parents and in F_3 progeny showed an enormous variation in this character, due to environment. There was definite evidence that segregation occurred as regards height of plant, but its nature could not be determined accurately.

Correlation studies of F_2 plant characters revealed small but apparently significant correlations between spike density and (1) length of longest culm, (2) number of culms, (3) total culm length, (4) awn classes, and (5) thickness of neck and between awn classes and (1) length of longest culm and (2) number of culms. The odds were about 142 to 1 that the correlation between spike density and thickness of neck was nonlinear. In all other cases the rather small odds suggested that the other correlations reasonably approached lin-

earity. The rather large coefficients of correlation and correlation ratios between square-headedness and spike density did not seem of great genetic importance, and those found between length of longest culm and (1) total culm length and (2) number of culms seemed physiologic rather than genetic in nature. The data suggested linkage between the factors for the characters of spike density and awn classes.

[Anomalies in certain wheat hybrids], L. Blaringhem (*Bul. Soc. Bot. France, 72 (1925), No. 3-4, pp. 341-350, pl. 1, figs. 2*).—Seeds of wheat obtained by crossing varieties of *Triticum vulgare* among themselves or by crossing *T. vulgare* with *T. spelta* showed all the regular stages usual to such crossings, but all crossings of such species with *T. monococcum* showed anomalies, which are described.

Inheritance of deformed leaves in Pharbitis nil, Y. Imai (*Bot. Gaz., 80 (1925), No. 3, pp. 276-287, fig. 1*).—The Japanese morning-glory (*P. nil*) shows variegation (several types), deformation, and deficiency. The present account deals with the genetical behavior of the variegated and deficient leaves.

Meiosis in the pollen mother cells of Oenothera biennis and Oenothera biennis sulfurea, R. E. Cleland (*Genetics, 11 (1926), No. 2, pp. 127-162, figs. 42*).—This is a contribution from Goucher College.

"Old-gold" flower color, the second case of independent inheritance in Oenothera, G. H. Shull (*Genetics, 11 (1926), No. 3, pp. 201-234, pl. 1, fig. 1*).—This is a contribution from Princeton University.

Brittle races of Oenothera lamarckiana, H. de Vries (*Bot. Gaz., 80 (1925), No. 3, pp. 262-275*).—This study originated with two races, one of which (*O. lamarckiana similis*) was found in the field at Hilversum, and the other (*O. lamarckiana scindens*) in the author's experimental garden at Amsterdam. The genetical constitution of the three races here studied is expressed, with discussion.

Mendelian inheritance in hybrid warblers, N. Morss (*Amer. Nat., 60 (1926), No. 669, pp. 384-387*).—Data are presented showing that two independent pairs of factors are mainly responsible for the differences in color between the golden-winged warbler (*Vermivora chrysoptera*) and the blue-winged warbler (*V. pinus*). Two intermediate forms, *V. lawrencei* and *V. leucobronchialis*, are attributed to hybridization with segregation of the pairs so that one is dominant and the other recessive in these species.

The problem of the inheritance of acquired characters in modern genetics, R. Blanco (*El Problema de la Herencia de los Caracteres Adquiridos en la Genética Moderna. Lugo, Spain: Cons. Prov. Fomento, 1925, pp. 65*).—A discussion.

A method for calculating linkage values, H. W. Alberts (*Genetics, 11 (1926), No. 3, pp. 235-248, figs. 2*).—A constant k which shows the relation of observed values in linkage studies to independent inheritance is obtained in this contribution from the Illinois Experiment Station. When k=10, independent inheritance is indicated; when k=more than 10 but less than 16, coupling; when k=less than 10 but more than 8, repulsion; and when k=less than 8, some factor other than chance resulting in marked deviations from theoretical ratios. Formulas given show the interrelations of members of theoretical gametic and zygotic series, the relationship between the extreme terms and middle terms of a distribution is shown, and formulas and tables for determining the percentage of crossing over are presented.

A case of sex-linked balanced lethal factors in Drosophila melanogaster [trans. title], N. W. Timoféeff-Ressovsky (*Ztschr. Wiss. Biol., Abt. D, Arch. Entwickl. Mech. Organ., 107 (1926), No. 4, pp. 651-671*).—A female which was heterozygous for a sex-linked character described as abnormal abdomen was

found to have produced offspring in which the females were much in excess of the males, the ratio being 24:1. A genetic analysis of the X chromosomes of this female showed that one chromosome contained a lethal factor l^1, while the other contained a second lethal factor l^2. The appearance of such a female was only possible if a female heterozygous for the lethal factor l^2 was mated with a male having an abnormal abdomen and whose X chromosome also contained a gene for the lethal factor l^1.

Hybrid vigor and tumors in mice, D. F. JONES (*Amer. Nat., 60 (1926), No. 670, pp. 482–484*).—The author discusses hybrid vigor and concludes that it is due to the accumulation of numerous dominant factors as distinct from Castle's suggestion (E. S. R., 55, p. 634) that it may be due to a physiological stimulus resulting from the interaction of different genetic factors.

The activity of displaced testes and its bearing on the problem of the function of the scrotum, C. R. MOORE (*Amer. Jour. Physiol., 77 (1926), No. 1, pp. 59–68, figs. 2*).—Testes of the rat and guinea pig transplanted to a subcutaneous position continued their spermatogenetic function for from 3 to 9 months, though spermatozoa were not formed. Similar testicles located in the abdomen showed no activity of the germinal epithelium. The lower temperature under the skin is assumed to be more nearly like that of the scrotum.

These investigations were conducted at the University of Chicago and furnished evidence in support of the hypothesis of the temperature-regulating function of the scrotum (E. S. R., 53, p. 428).

The relation of the scrotum to germ cell differentiation in gonad grafts in the guinea pig, C. R. MOORE (*Amer. Nat., 60 (1926), No. 669, pp. 324–333, fig. 1*).—In continuing the studies of the temperature-regulating function of the scrotum at the University of Chicago, referred to above, a testicle from a 14-day-old male guinea pig grafted in the scrotum of a 60-day-old male guinea pig was found to show all grades of the spermatogenetic cycle, including the presence of spermatozoa, when removed 5.5 months after the operation. Subcutaneous or intraperitoneal grafts showed some activity but never the presence of spermatozoa.

Ovarian grafts in the scrotum of rats or guinea pigs did not show any effects which could be attributed to the lower scrotal temperature.

The injection of testis material into the rat and its effect on spermatogenesis, W. J. QUICK (*Amer. Jour. Physiol., 77 (1926), No. 1, pp. 51–58*).—Subcutaneous or intraperitoneal injections of suspensions of spermatozoa or macerated testis material repeated for from 1 to 5 times have had no apparent effect on the production of normal spermatozoa in the 13 male rats so injected in experiments at the University of Chicago. Two of the males were not mated after the treatment, but 9 of the other 11 produced litters. Cysts present in some of the injected males as a result of the treatment tended to cause mechanical displacement of the testes, which resulted in degeneration.

The duration of the potency of the spermatozoa of mammals in the epididymis removed from the organism [trans. title], M. E. IWANOW (*Compt. Rend. Acad. Sci. [Paris], 183 (1926), No. 3, pp. 456–458*).—Preliminary experiments have shown that the motility of spermatozoa could be conserved for several days, and even weeks, in certain cases when preserved in the epididymis removed from the animal, but when such sperms were used for the purpose of artificial insemination the results with rabbits and guinea pigs were negative in 1924. During 1925 some success was obtained, and in 1926 with the improved methods of technique fertilization occurred with sperms preserved in the epididymis for 7 days in a rabbit and 8 days in a guinea pig.

The relation of the male to the hatchability of hens' eggs, F. A. Hays (*Science, 64 (1926), No. 1660, p. 408*).—Data are presented from the Massachusetts Experiment Station showing that almost no eggs hatched which were produced by 7 Rhode Island Red pullets when mated to the same cockerel, though many were fertile. When the same birds were mated to another cockerel in a second year the hatching percentages of fertile eggs varied from 0 to 82 per cent. It is pointed out that physical characters of the eggs appear to be of less importance in relation to the hatchability of fertile hens' eggs than the genetic make-up of the hen laying the egg or the male fertilizing the eggs.

FIELD CROPS

[Field crops work at the Georgia Coastal Plain Station, 1925], S. H. Starr (*Georgia Coastal Plain Sta. Bul. 6 (1926), pp. 8–21, 23–40, 44–46, 53–56, figs. 8*).—Varieties outstanding over periods in continued comparisons (E. S. R., 54, p. 130) included Georgia Red wheat, Hundred Bushel oats, Abruzzi and South Georgia rye, strains of Toole and Cleveland, Lightning Express, Cook, and Dixie Triumph cotton, Whatley and Hastings Prolific corn, North Carolina peanuts, Otootan and Laredo soy beans, Iron and Brabham cowpeas, barnyard millet, Tracy Early Black velvet bean, Anstrian winter field pea, Monanthos, hairy, and purple vetch, Tifton bur clover, Red Bliss potatoes, McMillan Cluster, Hardshell, and Southern Queen sweet potatoes (for acre yields), and Yellow Prior tobacco. The yields of hay mixtures and the merits of miscellaneous legumes and grasses are set forth. Combination of the three was superior to seeding either carpet grass, Dallis grass, or lespedeza alone for pasture.

October 15 to November 1 appeared to be the optimum period for seeding small grains, with a 6-pk. rate for wheat. Fertilizer tests suggested for oats 400 lbs. of acid phosphate, 100 lbs. of sodium nitrate or its equivalent, applied as top-dressing, and 50 lbs. of potassium chloride or its equivalent.

For cotton on typical Tifton sandy loam a 9–3–5 fertilizer is indicated, with a slight increase in nitrogen and potash on lighter soils. On good soils 800 to 1,000 lbs. per acre seemed desirable, and quickly available sources of nitrogen were preferred. Top-dressing tests recommend 100 to 125 lbs. of sodium nitrate or its equivalent in ammonium sulfate applied at chopping. Spacing tests suggest 2 stalks per hill 12 to 15 in. apart in 3.5-ft. rows for good results. Liming was not economical, whereas green manure in combination with a complete fertilizer gave good results with both cotton and corn.

A 10–2–4 fertilizer was the best combination used for corn on Tifton sandy loam, with slight increases indicated for lighter soils. The fertilizer should be applied at planting on average soils. The type of husk seemed the major factor in weevil damage, a husk of fine texture which fits closely and extends well over the tip repelling the weevil markedly.

Fertilizer tests with peanuts recommend from 10 to 12 per cent of phosphoric acid, 2 to 3 of ammonia, and 2 to 4 per cent of potash, together with lime. Spacings of from 6 to 7 in. are indicated. In 1924 and 1925 no benefit accrued from the use of hulled nuts.

Commercial varieties of sweet potatoes fluctuated less in yield with extremes in seasonal conditions (rainfall) than did productive noncommercial sorts. April planting, late harvesting, and spacings between 8 and 20 in. in 3.5-ft. rows gave highest yields, and best results were also had from 8–6–2, 8–4–4, and 8–2–6 fertilizers, with from 600 to 800 lbs. the most profitable acre rate. Source of seed stock, northern- or southern-grown, seemed to influence yields little. Data for 4 years showed the average percentage of rot in storage of 16 varieties to

range from 5 to 43 per cent. Roots from well balanced fertilizer formulas have shown the least rot.

Experimental results with potatoes suggest planting March 15 to April 1 and using an 8-4-4 fertilizer at from 1,000 to 1,200 lbs. per acre. Overhead *irrigation used less water and gave more marketable tubers than subirrigation.* Both surpassed unirrigated potatoes.

Further tests continued to recommend not less than 1,000 lbs. per acre of an 8-3-5 fertilizer for tobacco, and a small addition of manure gave decided benefits. The nitrogen should be equally from organic and inorganic sources.

[Field crops experiments at the Crookston, Minn., Substation, 1925], C. G. SELVIG (*Minnesota Sta., Crookston Substa. Rpt. 1925, pp. 6–8, 15–33, 34–36, 45–51, 52–56, 72–76, 77–80, figs. 2*).—Experiments with field crops (E. S. R., 55, p. 332) reported on comprised variety tests with spring and winter wheat, corn, oats, barley, rye, flax, alfalfa, sweet clover alone and with nurse crops, soy beans, potatoes, mangels, sugar beets, and annual hay crops; seeding tests with wheat and rye; trials of wheat-flax and oats-flax mixtures; studies on the longevity of scarified and unscarified seed of alfalfa and sweet clover; soil preparation, seed selection, varietal and seed stock, manuring and fertilizer tests, and experiments on the utilization of sweet clover and straw on potatoes; fertilizer, depth of plowing, date of planting, and spacing tests with sugar beets; and crop rotations. Agronomic information and the susceptibility to rust, scab, and glume spot are recorded for a number of wheat varieties and hybrids. Variety and fertilizer trials at Mahnomen and Gary are summarized, and an article entitled Potato Culture and Fertility Practices in the Red River Valley, by T. M. McCall, is appended.

[Field crops experiments at the Morris, Minn., Substation, 1925], P. E. MILLER (*Minnesota Sta., Morris Substa. Rpt. 1925, pp. 23–38*).—Experimental work (E. S. R., 55, p. 735) reported on in these pages includes variety tests with spring and winter wheat, oats, barley, rye, corn, flax, soy beans, field beans, alfalfa, and potatoes; trials of mixtures of flax with wheat and oats; and crop rotations.

[Field crops work at the Porto Rico Insular Station], F. A. LÓPEZ DOMÍNGUEZ, A. H. ROSENFELD, L. A. SERRANO, P. OSUNA, and R. FERNÁNDEZ GARCÍA (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt., 1925, pp. 24–28, 29–31, 35, 36, 42, 43, 49–59, 70–74, 85–87, 88–96, 110–112, 114; also in Spanish ed., pp. 26–30, 31–33, 38, 39, 45, 46, 52–64, 74–77, 89, 90, 92–100, 115–118, 119*).—Experiments with sugar cane during the period of the report included trials of varieties and seedlings, comparisons for resistance to mosaic, fertilizer tests, breeding work, and a test of the effect of pruning the growing tip. Comment is made on a yellow striped sport of D. 1135 and adventitious buds of P. R. 417 and on production of seed (cuttings) by different varieties. Special activities by Rosenfeld included studies of varieties and seedlings, comparisons of the better varieties, reports on the Java P. O. J. canes (E. S. R., 54, p. 133) and on B. H. 10(12) and S. C. 12(4) canes (E. S. R., 55, p. 232), a study of the sugar industry in Vieques Island, and an investigation of the declining productivity of the older varieties in Louisiana and their replacement by P. O. J. 234.

Sugar cane fertilized with filter press mud produced 12.6 tons per acre, while untreated cane averaged 6.3 tons. In a test of the effect of nutrients on the rate of maturity of Uba cane, cane from unfertilized plats gave juices with the highest purities, and of the fertilized canes those treated with potash gave juices with higher purity than when no potash was used. The purity was in proportion to the potash application. Although as much as 0.25 per cent sodium chloride on the weight of dry soil was used on marsh-land soil,

no bad effect could be detected on sugar-cane plants. Analyses showed that for each ton of "Rayada" cane on a virgin alluvial soil there was removed 2.47 lbs. of ammonia, 0.93 of phosphoric acid, 5.93 of potash, and 0.9 lb. of lime. Varieties in greatest demand included B. H. 10(12), S. C. 12(4), P. R. 329, F. C. 306, P. R. 328, D. 117, and D. 1135.

Varietal trials were also made with cowpeas, yautia, tania, miscellaneous legumes, and forage grasses. The characteristics of the vines, flowers, and roots, and the yields are tabulated for 224 varieties of sweet potatoes.

[Field crops experiments in South Carolina] (*South Carolina Sta. Rpt. (1926), pp. 69–77, figs. 5*).—Further studies (E. S. R., 54, p. 635) reported on from the station and substations included variety trials with corn, sweet potatoes, and peanuts, fertilizer tests with corn, oats, potatoes, and sweet potatoes, source of seed trials with potatoes, topping tests with tobacco, trials of legumes and cover crops, pasture studies, and crop rotations.

[Agronomic experiments in Utah], G. STEWART, A. F. BRACKEN, D. W. PITTMAN, J. W. CARLSON, and R. J. BECRAFT (*Utah Sta. Bul. 198 (1926), pp. 20–22, 23, 24, 25, 26, 28–31, 64, 65*).—The outstanding results in varietal trials with spring and winter wheat, corn, and barley; a barnyard manure, green manure, and stubble disposal test with wheat; breeding work with wheat and potatoes; a test of time of plowing and manuring silage corn; irrigation tests with alfalfa, sugar beets, potatoes, field peas, and wheat; trials of forage and catch crops; seed production studies with alfalfa; control work with wild morning glory; and range reseeding tests are noted as heretofore (E. S. R., 52, p. 732).

No difference was observed between yields from fall and early spring plowing, whereas later spring plowings showed marked decreases. Seven to 8 in. seemed to be the depth for maximum net returns. Alternate fallow and crop appeared to be the safest and most efficient practice in comparison with continuous cropping, 2 crops and 1 fallow, and 1 crop with 2 years of fallow.

Seeding tests with Turkey wheat indicated not less than 5 pk. per acre not later than October. Ordinary drilling 7 in. apart gave higher wheat yields than where the rows were spaced further apart, and in most cases cultivation decreased yields. When wheat was cut as soon as ripe and at 10-day intervals over 2 months, the weight per bushel dropped from 61 to 57 lbs. but no change took place in the gluten content, loaf volume, and quality of bread from the delayed cuttings.

[Field crops investigations in Washington], E. G. SCHAFER ET AL. (*Washington Col. Sta. Bul. 208 (1926), pp. 23–25, 26, 30, 31, 40, 44–46, 48, 49, 50–53, 57, 58, 59, 60, 61*).—Continued experimental activities (E. S. R., 54, p. 827) reported on from the station and substations embraced variety tests with winter and spring wheat, corn, oats, barley, rye, flax, alfalfa, sweet clover, and sweet potatoes; seeding tests with wheat and potatoes; breeding work with wheat, oats, and potatoes; weed control studies; tests of cover crops; and rotations.

The total yield of grain during equal periods was greater in rotations in which field peas replaced summer fallow. Wheat after peas yielded less than wheat following good summer fallow but more than after corn or sunflowers. Field peas after wheat in different rotations averaged 22.7 bu., while spring wheat following wheat in rotations averaged 21.9 bu. Spring wheat and oats and field peas gave much higher yields after fallow than after corn or wheat at Waterville.

From 40 to 45 cultivations with the knife of the weeder set 3 to 5 in. deep were required during the growing season to keep bindweed or wild morning glory below the surface. After 2 years of such cultivation about nine-tenths

of the original infested area was free from the weed. Results on the Irrigation Substation demonstrated that the chief value of corn cultivation on the fine sandy loam soils of central Washington is in weed eradication.

Four winter wheat varieties seeded on three dates on early and late fallow and on alfalfa sod gave indications that under the same date of seeding the variety producing the best yield or quality for conditions of early summer fallow may not be the best adapted to land summer fallowed late or where legumes are grown in rotation, nor may that same variety excel if the seeding date be changed. Spring and winter wheats were found of equal merit at the Adams Substation when the winter wheat did not complete emergence until spring and the spring wheat had been seeded early. An experiment on seedbed cultivation at planting of spring wheat showed that the use of a harrow following a drill may add to the yields, and that the use of individual press wheels following a hoe drill can be substituted for the harrow without sacrificing yield. The use of press wheels is recommended for light soils subject to drifting. Harrowing winter wheat in the spring resulted in decreased stands and yield at the Waterville Substation.

Alfalfa and sweet clover seeded on ground cropped the previous year were unsatisfactory at Waterville, but seeded after a year of clean fallow they provided a limited green pasture in summer after the small grains dried up. Neither has yielded as much hay as the small grains. Biennial white was superior to biennial yellow sweet clover on the Irrigation Substation in carrying capacity of dairy cattle and sheep. Sheep found them equally palatable.

Close spacing of potato seed in the row gave the highest total yield and the most No. 1 tubers at the Irrigation Substation. Larger yields were obtained with increased application of water within the limits of the amounts used. Where water was applied according to the growth stage of potatoes the highest yields were obtained with enough water to maintain vigorous growth until blossom bud formation was evident, after which a more abundant supply was uniformly maintained until the tubers were ready to begin ripening.

Germination of seven legume crops was decidedly higher under two-thirds shade and one-third shade than in the open, apparently because surface moisture was maintained better under shade. However, all except spring vetch developed much more rapidly in the open. Designating the average growth of the crops in full sun by 100, the growth under one-third shade would be 80.5 and under two-thirds 43.9. Alfalfa seemed more sensitive to shade than Hubam or sweet clover.

[Agronomic work in Wyoming] (*Wyoming Sta. Rpt. 1926, pp. 162, 163, 179*).—Varietal leaders in continued comparisons (E. S. R., 54, p. 733) embraced Marquis, Red Bob, Kubanka, and Dicklow wheat, Markton and Iogren oats, and California Feed, Hannchen, and Charlottetown barley. Exceptional yields were obtained from a strain of Red McClure and a strain of Pearl potatoes. A rotation consisting of four years of alfalfa and two of crops seemed superior to a shorter sequence. In tests at Archer, in cooperation with the U. S. Department of Agriculture, use of the furrow drill resulted in a 20 per cent increase in the winter wheat yield, and together with late spring fallow, increased yields over 30 per cent in comparison with the common drill.

Root nodule bacteria of Leguminosae, E. B. Fred, A. L. Whiting, and E. G. Hastings (*Wisconsin Sta. Research Bul. 72 (1926), pp. 43, pls. 15, figs. 6*).—Investigations dealing with laboratory study of the root nodule bacteria of legumes and of growth conditions for cultures to prove effective in the field under favorable conditions and with field conditions influencing the bacteria in their relation to the host plant have been extensively noted from other sources. Experiments on factors influencing the entrance of the bacteria into

the plant concerned the rate of movement of nodule bacteria in the soil, effect of ground water on such movement, nitrates in plant tissue, and the influence of nitrates, moisture, temperature, reaction, and germinating seed on nodule bacteria. The effect of nodule bacteria on the host plant was shown by comparisons of nitrogen fixation with strains of alfalfa bacteria and soy bean bacteria and by tests of the effects of inoculation on yield and nitrogen content of alfalfa and soy beans, on the balance of nitrogen in the soil, and on the quality, yield, and pod production of peas, and of the relation of process to distribution of disease. Studies around the bacterial life in the soil in the absence of the host plant had to do with the longevity of bacteria in sterilized and unsterilized soil, influence of nitrates and carbonates, and nitrogen assimilation. Miscellaneous experiments involved the effect of freezing on nodule bacteria, distribution of nodule bacteria in manure, and the effect of inoculated and uninoculated legumes on subsequent crops of nonlegumes.

Winter hardiness in alfalfa varieties, F. H. Steinmetz (*Minnesota Sta. Tech. Bul. 38 (1926), pp. 33, figs. 6*).—The relative winter hardiness of Grimm and Kansas-grown common alfalfa was studied by using several available methods in an endeavor to ascertain ready means for distinguishing hardy and nonhardy types.

Alfalfa plants seemed to have no autonomous rest periods, as plants came into active growth within 3 days when brought into the greenhouse during every month in which growth was not possible in the field. The plants appeared to be forced into inactivity by unfavorable environmental conditions. The varieties studied have a critical period during early spring when the snow disappears and the soil thaws. Resistance to cold seemed to increase in the roots of both varieties as winter approaches and to disappear with the coming of spring. Temperatures at the soil surface beneath the snow indicated that the snow amply protects alfalfa plants against killing by low temperatures. Freezing injury resulted in the destruction of the central portion of the root, leaving it susceptible to infection by decay organisms. The crown buds are evidently hardier than the root tissues just below them.

The thermoelectric method used in determining the freezing point of root tissues was rapid but in general did not seem reliable for differentiating between hardy and nonhardy varieties. No absolute correlation was found between the degree of freezing point depression and resistance to killing by freezing. Physical determinations upon sap expressed from the roots showed that the quantity of press juice obtained from 100 gm. of material at the respective pressures bears no apparent relation to the hardiness of varieties. While viscosity was related to total solids in the sap, neither appeared to be connected with hardiness.

The alfalfa root seems to function as a storage structure for carbohydrates and possibly for small amounts of protein reserves. There appears to be a transformation of starch into sugar during the late autumn and early winter and apparently a partial reconversion in early spring, in accordance with the principle of Fischer. The Grimm was found to have more sugar, expressed in terms of total carbohydrates, than the Kansas-grown common. Considering that sugar acts as a protective colloid, Grimm appeared to have an advantage. No apparent quantitative relation existed between pentosan content and hardiness. The amino-nitrogen fluctuations did not indicate that protein cleavage is important in protecting proteins against precipitation.

As positive measures of differences between varieties studied, the freezing of potted plants or roots removed from the soil was found the most practical and reliable method.

Irrigated alfalfa in Washington, H. P. Singleton (*Washington Col. Sta. Bul. 209 (1926), pp. 15, figs. 5*).—Varietal trials at the Irrigation Substation at Prosser, Wash., showed northern-grown strains of common alfalfa to average higher in yields than Grimm and other variegated strains as a group. The latter seem better adapted for localities where the former winterkill. Turkestan and the nonhardy Peruvian gave lower yields. Considering yield and quality, cutting test results recommend cutting alfalfa when one-half in bloom.

Bean growing in northern Idaho, eastern Washington, and eastern Oregon, B. Hunter (*U. S. Dept. Agr., Farmers' Bul. 1509 (1927), pp. II+14, figs. 4*).—This is a further revision of and supersedes Farmers' Bulletin 907 (E. S. R., 38, p. 434). It indicates suitable districts, favorable factors and advantages in bean production, describes cultural methods and field practices, and discusses varieties, improvement, marketing the crop, by-products, and production in competing areas.

Red clover experiments, T. K. Wolfe and M. S. Kipps (*Virginia Sta. Bul. 252 (1926), pp. 24, figs. 13*).—Experiments in cooperation with the U. S. Department of Agriculture were concerned with the hay yields and anthracnose resistance of red clover from different sources. The extent of red clover seed production in Virginia is described, with notes on a method for removing buckhorn plantain from red clover seed and on substitutes for red clover.

Fall and spring seedings of red clover from domestic and foreign sources agreed with results obtained elsewhere in showing that anthracnose infection is often less and the yields larger from fall than from spring seeding. Anthracnose appeared to be one of the chief reasons for death of spring-seeded clover during the following summer. Trials at the station and at Arlington, Va., showed the sources of red clover most resistant to anthracnose to include Tennessee (disease-resistant), Virginia, Maryland, Ohio, and Michigan, and these are indicated as best for the Virginia farmer. If foreign-grown seed must be used, the tests indicate that seed from Chile, France, and north European countries are best for Virginia conditions.

[Cotton investigations in South Carolina] (*South Carolina Sta. Rpt. 1926, pp. 10–17, 19, 20, 42, 43, 44, 45, figs. 3*).—The continuation of previously noted experiments (E. S. R., 54, p. 636) is reported on.

The differences noted in the resistance of the bolls of the Humco Cleveland, Dixie Triumph, and Webber varieties to needle puncture were found to be closely correlated with resistance to puncture by the boll weevil. As a rule, their bolls increased in hardness from day to day until from 3 to 4 weeks old, after which there was relatively little change in resistance to puncture. Preliminary indications are that hardness of the bolls is influenced by fertility conditions. Low fertility seemed to cause earlier hardening, especially for early-season bolls, whereas bolls developing from blooms after July 20 hardened as rapidly under high fertility conditions as on poorer soil. Soil moisture, air humidity, and temperature also seemed to have direct bearing on these qualities. Additional fruiting studies resulted similarly to those recorded earlier. Irrigation and shading of cotton gave indications that soil moisture is the most important factor in varying the length of the boll period of cotton, the period being curtailed by shortage of soil moisture.

In spacing experiments involving Cleveland, Dixie Triumph, and Carolina Foster the increased earliness due to close spacing was found about equal in the varieties, although they differed somewhat in their growth habits. The difference in earliness was also apparent in the acre yields of seed cotton. The maximum yields in practically every case were produced with 6-in. spacing, although yields from 8-, 9-, and 12-in. spacing differed little. Very little

weevil damage was observed on any plat. The 6- to 12-in. spacings gave similar yields whether two presquare poison applications were made or poison was applied as seemed necessary. In further hill-spacing tests an increase in earliness and generally an increased yield came from a larger number of plants per hill. Continued recommendations are that cotton should be spaced to average about 1 stalk every 6 in. in the 4-ft. row, providing for about 21,000 plants per acre. On the average, higher yields may be had from plantings at Florence between April 1 to 15 if conditions favor germination then.

Cleveland, Humco Cleveland, and Coker Cleveland 5 yielded highest on dusted plats and Coker Delta led the varieties given only two applications of poison. Piedmont Cleveland, Lone Star, Okra Leaf Acala, Miller, and Trice yielded high in adaptation tests, and Dixie Triumph was foremost in the wilt resistance trial on badly infected soil.

Spinning tests in cooperation with the U. S. Department of Agriculture indicated that cotton grown at the station and at other points in the State in 1925 produced lint of rather high spinning quality in spite of unfavorable seasonal conditions. While the staple in some cases was a little shorter than normally produced by the varieties the spinning quality was good for the length of staple.

In accord with previous results on the time of applying nitrogenous fertilizers the greatest yield increase occurred where 50 lbs. of sodium nitrate was supplied at chopping and 50 lbs. when the first squares formed. Addition of 100 lbs. of sodium nitrate when the first squares began to form was next in effectiveness. The fertilizer experiments as a whole recommend for cotton in the Coastal Plain of South Carolina 600 to 800 lbs. per acre of fertilizer containing 9 to 12 per cent of acid phosphate, 3 to 5 of ammonia, and 3 to 4 of potash, with 150 lbs. of sodium nitrate or 110 lbs. of ammonium sulfate as a side application. For the Piedmont 600 to 800 lbs. of fertilizer analyzing 10 to 12 per cent phosphoric acid, 3 to 5 of ammonia, and 2 to 3 per cent of potash is indicated with the same top dressing as for Coastal Plain soils. Cover crop experiments indicated that land can be rapidly improved and planted to cotton each year provided a good cover crop of rye or vetch is produced each winter and turned under. Where rotation is practiced and a legume follows small grain the land is improved more rapidly.

Growth and development of cotton plants at Greenville, Tex., H. C. McNamara, J. W. Hubbard, and R. E. Beckett (*U. S. Dept. Agr., Dept. Circ. 401 (1927), pp. 18*).—The growth and behavior of the cotton plant was observed under various cultural methods as affected by environmental conditions at Greenville, Tex. The effect of different planting dates at weekly and longer intervals and spacing 12 in. and unthinned upon the normal rate and sequence of production and the growth and development of fruiting parts was studied with Lone Star cotton. Comparative studies on growth and development were also made with Kasch, Mebane Latest Improved, Rowden, Truitt, Lone Star, Acala, and Kekchi.

Flowers appeared in ascending series along the main axis of the plant about three times as fast as in a horizontal series along the fruiting branches. The intervals between the appearance of flowers on the first nodes of successive fruiting branches averaged 2.4 days and between the appearance of successive flowers on the fruiting branches of the same plants 6.2 days. The germination and early growth of seedlings were more rapid in the late plantings. The period from planting to appearance of the first square ranged from 58 days on an April 2 planting to 19 days for plantings made July 24 and August 15. The

interval between appearance of successive fruiting branches was little affected by the planting date. For 1923 the means ranged from 2.28 to 2.93 days. In 1924 there was a slight tendency for the intervals between the appearance of successive fruiting branches to be longer on closer spacings. The intervals between the appearance of successive squares on fruiting branches were very irregular without significant differences between the different planting dates. The intervals between the appearance of successive squares on fruiting branches were longer in unthinned rows than in 12-in. spacings of each planting date.

The rate of square production appeared to be directly related to the vegetative vigor of the plants and not necessarily affected by the advance of the season. Long intervals between the appearance of squares may occur at any time during adverse weather conditions or when the plants are reaching maturity or bearing a heavy crop of bolls. The square period, the time from the appearance of a square until it flowers, tended to shorten on later plantings and was longer on unthinned cotton than on 12-in. spacing. The lengthening of the square period on the outer nodes of the branches appeared to be definitely related to the position on the plant or the slowing up of plant growth during the late season.

The maturation period of bolls was affected little by the planting date, lengthened with advance of season, and was also somewhat longer in unthinned rows, especially where the stand was very thick, than in 12-in. spacing. The period from planting to maturity was much longer on the earlier plantings, but most of this was in the seedling stage before the appearance of the first square.

No significant differences were found in the rate of growth and development of fruiting parts between any of the varieties studied when planted on the same date and subject to the same cultural treatment and weather conditions. No relation was shown between the number of locks per boll and the maturation period, the 4-lock and 5-lock bolls opening together in each variety.

The use of first generation crosses and other methods for improving southern varieties of corn, H. B. Brown (*Mississippi Sta. Bul. 236 (1926), pp. 31, figs. 4*).—The merits of several methods of corn improvement are discussed, with summaries of experiments involving them at the station.

Mass selection, which has brought forth good varieties, appears useful in maintaining their good qualities. Various modifications of the ear-to-row method during 10 years' tests did not result in significant gains. Crossing experiments during 9 years indicated that F_1 crosses of corn varieties, such as are grown in Mississippi and other southeastern States, will outyield the average of their parents. In a few cases the better yielding parent was surpassed. The gain of the F_1 crosses over the better parent was so slight that their use seemed hardly practicable. When plats of pure white and pure yellow corn were grown adjacent the data showed that there is considerable crossing between adjoining rows, but with separation the percentage falls rapidly. Selfed strains of southern corn varieties exhibited reduction in vigor, stalk size, and yields, and various abnormalities. Certain trial crosses between strains inbred for from one to three years yielded less than the original parent strains, while others made considerable gains.

The oat crop, C. A. Mooers (*Tennessee Sta. Bul. 136 (1926), pp. 17, figs. 7*).—Fall-sown or winter oats matured earlier and outyielded spring oats during a 10 years' test at the station, although spring oats fit better into the average cropping system. Fulghum as a spring oats decidedly surpassed Burt, and Kanota, a strain of Fulghum, seemed desirable in Tennessee. Fulghum is not recommended for fall seeding in the State. In prolonged trials at Knoxville and Jackson, Culberson oats was found 10 days earlier, less apt to lodge, and to yield equally with Virginia Gray Turf oats on good land. Comparisons of Tennessee, Texas, and Arkansas grown seed from the same original Red

Rust Proof strain did not reveal significant differences, except that contamination with smut reduced the yields from the Arkansas-grown seed.

Early March seemed to be the optimum time for seeding spring oats at the station and after March 15 on the Cumberland plateau and similar elevations. September was the best month for planting winter oats at the station and October at Jackson. For favorable conditions at Jackson 1 bu. of seed per acre sufficed for winter oats, 1.5 to 2 bu. being suggested for average or adverse conditions.

The merits of alfalfa, clover, grass, vetch, and rape seeded with winter and spring oats are shown, and fertilizers are indicated for oats under different regional and cultural conditions.

Experiments with certified Irish Cobbler potatoes, A. M. MUSSER (*South Carolina Sta. Bul. 232 (1926), pp. 20, figs. 4*).—In comparisons during 4 years certified potato seed averaged 57.1 bbls. per acre and noncertified seed 49.9 bbls. Certified seed generally excelled in the production of No. 1 tubers, stands, and comparative freedom from disease. Seed from Wisconsin and Vermont produced the highest average yields at the station, Florence, and Summerville for sources tested 5 years, and Michigan seed led the sources tested 4 years. Tests with stored seed suggested that with proper storage conditions seed stored from season to season might yield about as well as northern-grown seed for the first year. Subsequently the crop from stored seed might mature a few days later than that from northern seed.

Rules for seed testing (*U. S. Dept. Agr., Dept. Circ. 406 (1927), pp. 13*).—These rules, adopted by the Association of Official Seed Analysts of North America in August, 1926, outline procedure in sampling agricultural seed, in analyzing for purity and germination, evaluating results, and making reports.

Inspection of agricultural seeds, O. S. ROBERTS ET AL. (*Indiana Sta. Bul. 302 (1926), pp. 68, figs. 2*).—The tabulations presented show the purity, germination percentage, weed seed content, and for legumes hard seed content, for 745 official samples of agricultural seed obtained from seed merchants in Indiana in 1925.

Commercial agricultural seeds, 1926, J. M. BARTLETT ET AL. (*Maine Sta. Off. Insp. 122 (1926), pp. 74–83*).—Tables show the purity, germination, and weed seed content for 176 official samples of agricultural seed collected from dealers in Maine during 1926.

HORTICULTURE

[Horticultural investigations at the Georgia Coastal Plain Station] (*Georgia Coastal Plain Sta. Bul. 6 (1926), pp. 40–44, 46–52*).—Of 16 tomato varieties, New Stone produced the greatest number of marketable fruits over a 4-year period. Yield records taken on New Stone tomatoes planted at 15-day intervals from April 1 to July 1 showed that early planting is decidedly the best. Tomatoes responded to liberal fertilization with a formula high in all three principal ingredients. Overhead irrigation proved slightly more economical in water used in relation to yield than did subirrigation.

Thurmond Grey again proved (E. S. R., 54, p. 136) a superior watermelon. Watermelons thinned to one melon per vine produced the largest melons, but normal unthinned vines produced the greatest yield per acre.

Variety tests with beans, peas, peaches, grapes, strawberries, and dewberries are reported.

[Variety testing at the Crookston, Minn., Substation], C. G. SELVIG (*Minnesota Sta., Crookston Substa. Rpt. 1925, pp. 44, 45, 57–61*).—This comprises the usual brief notes upon the results of varietal tests with tree and bush fruits, vegetables, ornamentals, etc. (E. S. R., 55, p. 339).

[Variety testing at the Morris, Minn., Substation], P. E. MILLER (*Minnesota Sta., Morris Substa. Rpt. 1925, pp. 38–40*).—The usual brief report (E. S. R., 55, p. 742) upon variety tests with tree and small fruits.

Annual report of the plant breeder, J. P. GRIFFITH (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt., 1925, pp. 75–83; also in Spanish ed., pp. 78–87*).—In the belief that the avocado has great possibilities in Porto Rico, improvement work was actively pursued with this fruit during the year. Many new varieties of Guatemalan, West Indian, and Mexican origin were introduced. A test of various avocados as stocks showed the native or West Indian to be by all means the most successful. The Puebla, a Mexican variety, proved generally unsuited to Porto Rican conditions. Tests with the mango, jack fruit, and cacao are briefly discussed.

Studies with numerous Rubus species, both introduced and native, show that tropical species are quite generally resistant to the types of disease that attack northern species. Crosses were made between *R. probus* and Cuthbert and between *R. probus* and *R. trivialis*, the manatee dewberry. The treatment of wild raspberry (*R. rosaefolius*) seed with sulfuric acid (sp. gr. 1.84) for 45 minutes gave 95 per cent germination.

Of introduced grapes the Carman, a Texas variety, appears promising. A dwarf lemon known as the Meyer variety, obtained from the U. S. Department of Agriculture, gave promising results, one tree producing at 3 years of age over 300 fruits. It was found that this lemon could be quite easily propagated by hardwood cuttings buried in sand.

[Horticultural investigations at the South Carolina Station] (*South Carolina Sta. Rpt. 1926, pp. 46–49, fig. 1*).—Of 30 apple varieties tested for self-fruitfulness by covering the blossoms with glassene paper sacks, 5 only, namely, Golden Russet, Ozark, Bismark, Western Beauty, and Early Harvest, set fruits. Examination of the pollen placed in a 10 per cent sugar solution showed good germination in Golden Queen, Golden Delicious, Scotch Cluster, York Imperial, Apple of Commerce (Beach), Bismarck, Kansas, Coffelt, Payne, Simmons Red, Early Harvest, and Delicious. Winesap, Stayman Winesap, and Blacktwig pollen gave very poor results. Delicious, York Imperial, Golden Delicious, and Early Harvest proved satisfactory pollinizers for Winesap, Stayman Winesap, and Blacktwig.

As in the preceding year (E. S. R., 54, p. 642), fertilizer studies with the peach again showed the superior value of a high-grade fertilizer. At McBee, in the Sand Hill section, trees fertilized with an 8–8–4 material were most productive, and similar results were secured at Gramling, in the Piedmont region. Nitrogen fertilizers delayed the maturity of peaches as much as 10 days in 1925. The growing of a cover crop increased the yield of peaches the following season.

Cutting asparagus the first year after planting proved an injurious practice from the viewpoint of yields the succeeding season.

[Plant breeding at the South Dakota Station], N. E. HANSEN (*South Dakota Sta. Rpt. 1925, pp. 25–32*).—Attempts to breed hardy varieties from tender material have led to negative results, but it was pointed out that hardiness and desirable qualities may be obtained by hybridization. Crosses between hardy wild grapes of the Dakotas and nonhardy cultivated forms have yielded many promising seedlings, 32 of which are herein named and described, as are also 10 gooseberries resulting from crosses between the wild native and European forms. Four improved forms of wild black currants, a sand cherry, an apple, a plum, and a chokecherry are briefly discussed.

[Horticultural investigations at the Utah Station], T. H. Abell and A. L. Wilson (*Utah Sta. Bul. 198 (1926), pp. 44–50*).—The usual progress report (E. S. R., 52, p. 738).

Notes are presented upon the results of a strawberry variety test. Observations following severe winter injury to peaches in December, 1924, indicated that the severity of the injury was enhanced by lack of irrigation water in late summer, low soil fertility, unfavorable site, and peach borer injury. The testing of tomato stocks preparatory to breeding operations showed outstanding differences between strains within the same variety in type, yield, and time of ripening.

Tests of a large number of different Spanish types of onions showed a great confusion in nomenclature. The Riverside Sweet Spanish onion, a selected strain of Valencia, was found superior to all others because of its dark color, firmness, and spherical shape. Thinning tests with Riverside Sweet Spanish indicated the inadvisability of this operation when seeding was at the rate of from 2.5 to 3.5 lbs. per acre. Fall-planted mother bulbs yielded more seed per plant than spring-set bulbs, but the loss in stand in the fall bulbs was very large.

Thinning increased the proportion of large apples upon trees growing near Logan.

[Horticultural investigations at the Washington Station] (*Washington Col. Sta. Bul. 208 (1926), pp. 28–30, 61, 62, 65, 66, 68, 69*).—The usual annual report (E. S. R., 54, p. 835). Nitrogen-bearing fertilizers were found by O. M. Morris, H. J. Jensen, and W. A. Luce to be of benefit in orchards of low vigor and yellow foliage. An exception was found in the case of orchards located on very thin or gravelly soils and suffering from insufficient soil and soil moisture. Phosphorus and potassium fertilizers gave no direct improvement to either tree or fruit, but did influence the ground cover between the trees. Low production was also found to be associated with insufficient water, improper pruning, imperfect pollination, and the crowding of the trees.

Studies by F. L. Overley showed that peaches harvested immaturely failed to develop full color or quality. Overley and Jensen found that apples also, in order to attain maximum quality, must be practically full sized and well colored at harvest. Morris found that preliminary holding in common storage prior to cold storage was very destructive to the storage quality of Winesap, Rome Beauty, and Delicious apples.

Results of pollination tests, conducted by Morris and Luce near Wenatchee, suggest that Winesap, Delicious, and Arkansas Black are either partially or fully self-sterile, and that Rome Beauty, Jonathan, Winter Banana, and Esopus are self-fruitful. Cross-pollinizers are suggested for the less favored kinds. Bartlett, Bosc, and Anjou pears were inclined to self-sterility, and Flemish Beauty was self-fruitful.

At the Irrigation Substation, at Prosser, Jensen found that a single thickness of burlap placed over the strawberry bed at sundown kept the soil from 8 to 12° F. warmer than that without such protection.

D. J. Crowley, working with cranberries in Pacific County, found that fruit buds continued to form until the middle of December in a year of no frosts. Unfortunately, the new growth of the following spring was caught by a heavy frost, which seriously reduced the crop. Certain plats sprinkled throughout the night of the frost suffered no injury, and young freshly sanded bogs suffered less than older ones covered with heavy vine growth. Little difference was found in the keeping quality of scooped and of hand picked McFarlin and Centennial berries. Berries dried before being placed in the warehouse kept

much better than those taken in wet. McFarlin and Centennial bogs suffered reduced yields from scooping, while Howe, Early Black, and Burgess bogs, owing to a different habit of growth, were not affected.

Work in blueberry propagation showed good success with cuttings planted 2 in. deep in a 50-50 mixture of well-pulverized peat and sand. Among weed killers tested in the cranberry bog, kerosene showed considerable promise, killing grass and at the same time injuring the cranberries but slightly.

Insecticides and fungicides, 1926, J. M. Bartlett et al. (*Maine Sta. Off. Insp. 122 (1926), pp. 84–88*).—In conformity with the usual report (E. S. R., 55, p. 138), the results of analyses of fungicidal and insecticidal materials collected by the commissioner of agriculture during 1926 are herein presented.

Analyses of materials sold as insecticides and fungicides during 1926, C. S. Cathcart and R. L. Willis (*New Jersey Stas. Bul. 441 (1926), pp. 16*).—According to the usual procedure (E. S. R., 55, p. 38), this bulletin presents the results of analyses of samples of insecticides and fungicides collected during the inspection of 1926.

Insecticides and fungicides, F. T. Shutt (*Canada Expt. Farms, Div. Chem. Rpt. 1925, pp. 51–59*).—This reports analyses made of insecticides and allied materials.

The relation of seasonal factors to quality in sweet corn, C. A. Magoon and C. W. Culpepper (*Jour. Agr. Research [U. S.], 33 (1926), No. 11, pp. 1043–1072, figs. 12*).—Studies upon Golden Bantam and Stowell Evergreen corn harvested from plantings made at approximately 10-day intervals from April 28 to August 19 at Arlington Farm, Va., show that temperature is the most important among the various seasonal factors influencing the growing and canning of sweet corn. Rainfall had a very marked effect on plant growth but little effect on the chemical composition of cut corn or the quality of the canned product. No specific effect of sunshine was determined. Light frost had no significant effect on composition or upon the canned product, and even a heavy freeze had no immediate significant influence.

According to time of planting the number of days from sowing to the time of silking ranged from 55 to 79 for Golden Bantam and 63 to 92 for Stowell Evergreen. The shortest period occurred in early summer. Temperature also affected the time from silking to canning maturity, the range being from 20 to 40 days. Toughness of the kernel as measured by resistance to puncture increased continuously during the period of development and was found an important index to quality, which progressively declined as toughness increased. The proportion of cut corn to the ear increased more rapidly in midsummer than in autumn. The percentage of moisture in the kernels decreased continuously during development and was especially rapid in midsummer.

Total sugars were constantly changing during the development and maturation of the kernel, increasing for a time and then declining as maturity approached. Sucrose showed a similar increase and decline. Reducing sugar was high in the early stages and decreased steadily as maturity came on. Polysaccharides at the stage when corn was in prime condition for canning consisted of approximately equal parts of water soluble and water insoluble portions, presumably dextrins and starches. All chemical changes were directly influenced in their rapidity by temperature.

Planting and thinning distances for deciduous fruit trees, F. W. Allen (*California Sta. Bul. 414 (1926), pp. 29, figs. 11*).—A general discussion of planting plans and tree spacing, based upon studies in an experimental orchard at Davis and upon extended observations in various commercial orchards,

The author points out some of the outstanding evils of close planting and suggests proper distances for the principal fruits and nut species. Close planting was found especially precarious in nonirrigated orchards, where the water supply in the soil is a limiting factor.

Germination and storage of apple seeds, A. L. BAKKE, H. W. RICHEY, and K. REEVES (*Iowa Sta. Research Bul. 97 (1926), pp. 241–255, figs. 2*).—Records taken upon freshly removed apple seeds having an initial moisture content of 84.79 per cent and stored in ordinary room temperature showed a drop to 56.44, 41.53, 25.42, 9.88, and 7.6 per cent on the fourth, fifth, seventh, eleventh, and twenty-first days, respectively. Germination tests in the greenhouse in late February with apple seeds which had been stored in different situations, (1) common fruit storage, 5 to 10° C. (41 to 50° F.), (2) fruit refrigeration, 1 to 3°, (3) below freezing, 0 to −2°, (4) at room temperature, and (5) outdoors at from 10 to −25°, showed no significant benefit in any of the lots from soaking in distilled water for 20 hours previous to planting. Seeds of treatments 4 and 5 failed to germinate at all.

A part of each of the five lots was kept moist and a part dry. Germination records on the various sublots were distinctly in favor of the moist seeds. In the moist portion of lot 2 a maximum germination of 91 per cent was reached. In respect to time of planting the data showed little difference in favor of any one date between November 3 and February 24. The highest germination again occurred in the moist section of lot 2. In general, seeds planted after January 1 did not take as long to germinate as those sown earlier. Apple seed which had been air dried and held for one year failed to germinate. Injury to the seed coat mechanically or with acids failed to influence germination.

Fertilization of apple orchards, II, M. J. DORSEY and H. E. KNOWLTON (*West Virginia Sta. Bul. 203 (1926), pp. 53, figs. 10*).—This contribution is for the greater part a progress report upon long continued studies (E. S. R., 44, p. 638). One project, however, cultural studies at the station, is reported upon for the first time.

In the St. Marys experiment, started in 1911 in a run-down Rome Beauty orchard 20 years of age, nitrate applications consistently and significantly increased the bloom and the set of fruit, the growth of the tree, and the size of the crop. During the years 1918–1924, the greatest average annual growth was made on the complete fertilizer plat, and the maximum yield was obtained upon the nitrogen and phosphoric acid area. On account of soil erosion danger this orchard was maintained in sod after 1918.

In the Sleepy Creek experiment, started in 1913 with 9-year-old trees, nitrogen applications apparently benefited the trees, but when the results were analyzed statistically no consistent or significant differences in either growth or yield were shown between the several treatments; in fact there was as much variability within a single treatment as between treatments. This orchard was maintained in the cultivation and cover crop system of management.

The Rome experiment, started with 1-year-old trees in 1911 and maintained continuously in the tillage cover crop system, also failed to show any significant differences in growth or yield in favor of any treatment. The soil in this case was much more fertile than in the other orchards.

The cultural experiment at the station afforded comparison of different systems of orchard soil management. Among various treatments tested, sod without fertilizers resulted in the least growth, and either cultivation with stable manure and non-legume cover crop or cultivation with nitrate of soda and acid phosphate and a non-legume cover crop resulted in the greatest

In general conclusion the authors suggest that growth and fruitfulness can be maintained in the average apple orchard of West Virginia by cultivation or by sod, if supplemented with early spring applications of nitrate of soda or ammonium sulfate, or stable manure if procurable in sufficient quantities.

Sod-nitrate v. cultivation in the apple orchard, J. K. Shaw (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 328–337, fig. 1*).—In 1921 sod-nitrate and cultivation plats were established by the Massachusetts Experiment Station in an orchard which during the 10 years of its existence had been fertilized occasionally and managed on the tillage cover crop basis. Records taken from 1921 to 1924 showed a steady gain in yield in favor of the sod-nitrate plats. Variations in the yield of cultivated plats were traced to the turning under of an old sod on part of two of the plats. An estimate in 1923 of the size of the crowns of the trees in the several plats showed the nitrated trees to have developed considerably larger tops than the cultivated trees.

Measurements of trunk growth taken for several years before and during the present investigation showed considerable divergence in favor of the nitrated trees following the application of fertilizer. The Baldwin responded more vigorously to fertilizers than did McIntosh, Oldenburg, or Wealthy. Estimates of bloom were in favor of the nitrated trees. Counts made within 10 days after petal fall showed considerably higher set in the nitrated trees, especially in Baldwin and Wealthy. Grading of Oldenburg apples in 1924 showed a considerably larger proportion of large sizes in the fruit harvested from the nitrated trees.

The distribution of carbohydrate foods in the apricot tree, J. P. Bennett (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 372–384*).—Analyses, reported on the basis of the percentage of fresh weight, of the various parts of heavily and lightly pruned Royal apricot trees dug at monthly intervals following planting showed no significant seasonal changes in sugars, but large depletion in starch occurred during the growing season. Since hemicellulose content did not show seasonal fluctuations comparable with those of starch, the author feels that this material does not function as a reserve carbohydrate. No consistent differences were noted between lightly and heavily pruned trees in respect to the amount or the distribution of reserve food. During the season of accumulation (autumn), the heaviest deposition of starch was found in the roots, the percentage in the main and lateral roots being from two to three times that in the trunk and branches. In only 5 of 19 cases did the root system exceed 50 per cent of the total weight of the trees. The minimum was 35.2 and the maximum 62.3 per cent. At the end of the first growing season only from 9 to 17 per cent of the trees' reserves were contained in the branches, and at the close of the second season the new growth held but from 7 to 19 per cent of the reserve food. Hence pruning, when restricted to the new growth, would remove but a small percentage of the total reserves in the tree. Spurs were found to have the same percentage composition as the adjoining branches, and thus to comprise a very small fraction of the total reserve supply.

Notes on the dropping of immature sour cherry fruits, D. Bradbury (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 105–110*).—Studies at the Wisconsin Experiment Station with Early Richmond and Montmorency cherries showed that, while both varieties are self and interfruitful, self-pollination gives a lower percentage set than cross-pollination. In general, nondeveloping fruits dropped in three distinct waves, the last of which is termed the June drop. An examination of fruits of the first drop showed in one instance as high as 99 per cent of pollination, with 98 per cent of fruits in which the pollen tubes had reached the ovarian cavity. In over four-fifths of the aborting fruits both ovules were shriveled, a condition obtaining apparently before the tubes had

entered the cavity in view of the random growth of the tubes in the ovaries of such fruits. There was no evidence that the rate of pollen tube growth was slower in aborting than in normal fruits.

A study of abscising fruits of the second drop showed embryos in 41 per cent and no evidence of apogamy. A total of 95 per cent of the fruits contained embryos or had pollen tubes in the ovarian cavities. The embryo sac contents of a large number of the aborting second drop fruits were completely disorganized. Of 250 third-drop cherries examined, all but two contained embryos or endosperm tissue.

Since dropping was apparently not associated with lack of pollination or failure of the pollen tubes to reach the ovaries, the author concludes that unfavorable nutritional conditions are the important controlling factor in the dropping of cherries. This assumption was supported by the fact that in years of light bloom the percentage of abscising fruits was considerably less.

The functions of paper mulch in pineapple culture, W. J. Hartung (*Honolulu: Hawaiian Pineapple Co., 1926, pp. 31, pls. 2, figs. 10*).—Nitrogen determinations made upon soil samples taken at the beginning and at frequent intervals throughout the 714 days of a study of the effect of paper mulch upon the pineapple show that applications of fertilizer containing 316 lbs. of nitrogen (65.2 per cent inorganic and 34.8 organic) per acre increased the total nitrogen of the soil from 0.2875 to 0.343 per cent. Ammoniacal nitrogen in the upper soil of the fertilized plat disappeared after 91 days, but in a fertilized and paper-mulched plat this form of nitrogen was present in conspicuous amounts one year after fertilization. Even 500 days after application of the fertilizer some of the introduced nitrogen was in ammoniacal form. Nitrate nitrogen increased rapidly in both fertilized plats with the advent of the heavy spring rains, which apparently greatly stimulated nitrification. In the mulched and fertilized plat, nitrate nitrogen reached a higher maximum and was retained much longer than in the fertilized plat, indicating that paper mulch not only stimulated the activity of nitrifying bacteria but also prevented rapid leaching of the resulting nitrates.

Observations upon pineapple slips planted in sealed pots containing soil of measured moisture content indicated that 22.5 per cent is the critical point, below which water becomes unavailable for the pineapple. Data obtained in the field showed that paper mulch raised the average soil moisture from 4 to 6 per cent during the experimental period. In the same period, temperature readings in the upper 3 in. of soil showed that paper mulch raised the mean temperature 3.5° F. during the 714 days. Computation toward the close of the experiment of the air-dry weight of roots showed those of the mulched and fertilized plats to be much heavier. On a basis of 100 for the control, those of the paper mulch, fertilizer and paper mulch, and fertilizer areas were 150, 179, and 176, respectively. Fertilized plants had from 40 to 50 per cent of their roots in the upper 4 in. of soil, as compared with from 25 to 35 per cent for the unfertilized. All plats had 90 per cent or more of the roots in the upper foot of soil. Determinations of dry and green weight in the above-ground portion of plants made at the end of 6, 12, and 18 months from planting showed the fertilizers to have had a marked stimulating effect. Paper-mulched plants made a greater proportion of their growth during the first year than the nonmulched plants.

In respect to total and average weight of fruit, the fertilized plants were markedly in the lead. The paper-mulched plants were almost twice as productive as the controls, but the difference was largely in the number of fruits produced. Estimated yields per acre for the several plats were 15.18, 18.93, 21.68, and 12.23 tons for paper, fertilizer, paper plus fertilizer, and con-

trol. No significant differences were found in the percentage of nematode infestation. Inconclusive results were obtained in comparing perforated and nonperforated paper. Paper mulch practically eliminated weeds and hence saved a great deal of labor.

Palms of Florida, H. Mowry (*Florida Sta. Bul. 184 (1926), pp. 54, figs. 57*).—This paper, devoted principally to descriptions of the various species of palms, native and introduced, which are growing in Florida, also contains information upon the propagation, general culture, and temperature requirements of the family.

FORESTRY

Manual of forestry for the northeastern United States, R. C. Hawley and A. F. Hawes (*New York: John Wiley & Sons; London: Chapman & Hall, 1925, 2. ed., pp. XII+281, figs. 64*).—A second and corrected edition of this work (E. S. R., 39, p. 50), which is volume 1 of Forestry in New England.

National forest resources of Utah (*U. S. Dept. Agr., Misc. Circ. 71 (1926), pp. 27, figs. 16*).—A general discussion upon the location, principal features, and resources of the national forests of Utah, with comments on administrative policies regarding the development of timber, grazing, water, and recreational uses.

Foundations of silviculture upon an ecological basis, J. W. Toumey (*Ann Arbor, Mich.: Edwards Bros., 1924, pt. 1, pp. 1–171; 1925, pt. 2, pp. 172–314; 1926, pt. 3, pp. 315–476, figs. 4*).—This contribution, prepared in mimeographed form, is presented in three parts, as follows: (1) The site factors, (2) the forest, and (3) methods of investigating the site factors and the forest vegetation and relating one to the other.

Mixed v. pure forest plantations, R. R. Paton (*Ohio Sta. Bimo. Bul., 12 (1927), No. 1, pp. 18–20*).—A brief popular article pointing out the desirability of mixing forest species. Mixed plantings are considered less exacting on the soil in that the food demands are varied and the roots penetrate to different levels.

Effect of spacing and root pruning on the development of transplants, K. L. Janouch (*Jour. Forestry, 25 (1927), No. 1, pp. 62–67*).—Experiments in the Bessey Nursery, Nebraska, showed that a 6 by 1.5-in. spacing is very satisfactory in the transplant bed for both jack and yellow pine. Root pruning did not prove of any significant value in either species. Jack pine does not have a pronounced taproot, and severing the taproot of yellow pine caused a rather severe setback, lasting even to the first year in the field.

Season for sowing red and white pine seed, H. D. Petheram (*Jour. Forestry, 25 (1927), No. 1, pp. 57–61*).—Studies at the Cass Lake Nursery in Minnesota showed that although midsummer sowing gave the highest germination in both red and white pine, the resulting plants did not survive as well as those raised from late fall sowings. Very early spring sowings gave quite favorable results but not equal to late fall, the seedlings from which were larger and of better quality.

Loblolly pine primer, W. R. Mattoon (*U. S. Dept. Agr., Farmers' Bul. 1517 (1926), pp. [2]+38, figs. 27*).—In simple, nontechnical terms, aided by abundant illustrations, the author discusses the geographical distribution, economic importance, habits and rate of growth, establishment of seed beds and plantations, and the marketing of the timber of loblolly pine, a species of very important commercial value in the southeastern States.

On the seedling structure of Tilia vulgaris Heyne, H. S. Holden and S. H. Clarke (*Jour. Linn. Soc. [London], Bot., 47 (1926), No. 315, pp. 329–337, figs. 20*).—Technical descriptions are offered of *T. vulgaris* seedlings, which as a rule

occur rarely in England but in 1924 were found in fair numbers, indicating that the preceding year had been a favorable one for ripening seed.

The Hevea rubber tree in the Amazon Valley, C. D. LA RUE (*U. S. Dept. Agr. Bul. 1422 (1926), pp. 70, figs. 14*).—A report based upon extended personal surveys of the rubber producing situation, present and prospective, in important producing regions of Brazil and Bolivia. At the present time all of the rubber produced in this area is obtained from jungle trees, but large tracts of land were noted which were apparently well suited for plantations. The wild trees contained a great reserve of rubber which could be harvested in case of necessity or were the prices sufficiently high to warrant. Methods of tapping, collecting, and preparing rubber now in vogue in this region are described as extremely crude and wasteful. The botany of the genus Hevea is very incompletely known, but the plantation trees of the East Indies are believed to be identical with the white rubber trees found along the lower Amazon. In concluding, the author discusses the occurrence of diseases and gives a brief account of Castilla and Sapium, two other genera yielding rubber.

Gum arabic, with special reference to its production in the Sudan, H. S. BLUNT (*London: Humphrey Milford, 1926, pp. 47, pls. 22, figs. 4*).—A popular account, taking into consideration the distribution and botany of the tree, methods of gathering and marketing, chemical properties, and uses, with notes on the forest policy adopted by the Sudan Government for enlarging and protecting plantations and forests.

The water-retaining capacity of certain woods in relation to their microscopic structure, J. W. BEWS and R. D. AITKEN (*So. Africa [Dept. Agr.] Bot. Survey Mem. 8 (1925), pp. 34–41*).—Small blocks of the freshly cut older wood of 12 native Natal forest species and of 19 Australian eucalypts were dried in a steam oven to determine their water-containing capacity. In general the lighter, softer woods with a high initial water content lost water more rapidly and dried out more completely in a shorter time than did heavy, dense hardwoods having a lower original water content. Eucalypts lost water at a more uniform rate than did the native Natal species. Although the initial rate of water loss was slower in the Eucalyptus, the average total time required to dry out was approximately the same for woods of this genus as for the native species.

DISEASES OF PLANTS

Plant diseases (*South Carolina Sta. Rpt. 1926, pp. 41, 42*).—It is claimed that in 1926 corn smut was much more severe than usual, infection on the station plats amounting to from 6 to 36 per cent. The early varieties seemed to show less infection, but there did not appear to be any strong indication of resistance in any case. Ear rots are said to have been more abundant than usual, due possibly to a severe infestation of the corn earworm.

The stem blight of beans previously reported (E. S. R., 54, p. 648) is said to have been found in a number of places in the State, and also to have been reported from Georgia and Mississippi.

Angular leaf spot of cotton was more prevalent than usual and is said to have caused considerable damage where no control measures were used. Cotton wilt was also prevalent, and this resulted in a demand for seed of wilt-resistant varieties.

A rot of gladiolus caused by *Bacterium marginatum* was reported for the first time in the State, and it is said to have assumed serious proportions in two widely separated localities.

Plant pathology (*Utah Sta. Bul. 198 (1926), pp. 56–62*).—Investigations by B. L. Richards are reported on potato, canning crops, and miscellaneous diseases. Among the potato diseases particular attention was given to the virus diseases, mosaic, leaf roll, and spindling tuber having been studied. By the use of insect cages, greenhouse, and field plats the symptoms of mosaic and leaf roll were fairly well determined for each of the commercial potato varieties important in the State. Control methods, including tuber indexing, are said to have resulted in the complete elimination of rugose mosaic and leaf roll and to very definite reduction in spindling tuber.

In the canning crop studies, the work was confined to Fusarium wilt, mosaic, and western yellow blight of tomato. Selections for disease-resistant strains have resulted in obtaining four strains of the Stone variety which have a high degree of resistance to wilt. The study on mosaic was confined largely to cross-inoculation experiments, in which it was found that mosaic could be transferred from the potato to tomato and to the black nightshade, from *Physalis* sp. to tomato, and from tomato to Physalis, black nightshade, and yellow nightshade. Four types of mosaic of varying degrees of severity were obtained on the experiment farm in Davis County. Three of these continued true in type and have been carried through three generations. The western yellow blight, which practically ruined the tomato crop in 1905 and in 1924, appeared again in 1926 in a very severe form.

Notes are given on a number of diseases, all the data being obtained in the plant disease survey. The white spot of alfalfa is said to have occurred in a number of fields, in some cases seriously reducing the tonnage and quality of hay. The alfalfa stem nematode (*Tylenchus dipsaci*) was found present in practically half the fields surveyed in Salt Lake County. Crown wart (*Urophlyctis alfalfae*) was found in 16 per cent of the fields surveyed. There were also heavy infestations of leaf spot caused by *Pseudopeziza medicaginis*, and some evidence was obtained indicating heavy infestation of the bacterial stem blight (*Pseudomonas medicaginis*).

Two diseases observed in Utah for the first time were peach leaf curl caused by *Exoascus deformans* and the yellow leaf blotch of alfalfa.

Division of plant pathology (*Washington Col. Sta. Bul. 208 (1926), pp. 31–35*).—In continuation of previous investigations on wheat smut (E. S. R., 54, p. 841) a report is given of tests by F. D. Heald of 58 different methods of seed treatment in which negative results were obtained, no smut appearing even when the seed was heavily inoculated with smut spores.

Studies were made by Heald of winter injury of fruit trees in connection with the prevalence of perennial canker (*Gloeosporium perennans*) and the wood-destroying fungus *Schizophyllum alneum*. Winter injury is considered the principal cause of the severe outbreak of canker, and the wood-destroying fungus invaded the injured wood and completed its destruction. The apple variety Spitzenberg is said to have shown most winter injury, and it was also the most susceptible to canker.

The same investigator made a study of the fungus flora of normal apples and also of the fungi responsible for storage rots. Normal sound apples taken from storage at various times during the season were found to carry from a few thousand to as many as 100,000 fungus spores. While many of the species were harmless forms, others of proved pathogenicity were invariably present. Isolations of fungi from rotten fruit were made, and in addition to isolations which had not been identified, the following genera were represented: Alternaria, Acrostalagmus, Botrytis, Fusarium, Gloeosporium, Phomopsis, Penicillium, Rhizopus, and Stemphylium.

In cooperation with the divisions of chemistry and horticulture, a study was made of the different types of fruit wipers to determine the efficiency of wiping fruit for the removal of arsenical residues. None of the dry wiping machines proved effective in reducing the arsenic load of heavily sprayed fruit to the tolerated amount of 0.01 grain per pound of fruit. Analyses seem to indicate that the wiping rubs most of the arsenical residue into the wax, rendering it inconspicuous. Promising results are said to have been obtained with other methods of handling the fruit.

The effect of shade on western yellow blight of tomatoes was investigated by B. F. Dana, and it was found that shaded plants contracted the disease as readily as plants not shaded.

Infection studies of mosaic and related diseases of potatoes are said to have shown positive results in the transmission of witches'-broom when potatoes were grown in the field from inoculated progeny grown under glass. Inconclusive results were obtained in attempts to transmit the disease by the green aphid, and negative results followed core-graft inoculation. Core grafts also failed to transmit chlorosis. During five seasons' work with the same stock all progeny have become infected with chlorosis. Giant hill was transmitted to Netted Gem stock by means of core grafts, and progeny of giant hill plants have shown 100 per cent infection during the two seasons that they have been under test. One season's field work with core grafts for the transmission of rugose mosaic gave negative results. Dana claims that the season's work demonstrated the possibility of maintaining a strain of stock in regions where virus disease symptoms are masked.

Notes are given of a number of diseases newly reported or imperfectly known in the State.

Forage crop diseases, G. R. Bisby (*West. Canad. Soc. Agron. Proc., 5 (1924), pp. 60–64*).—The diseases here briefly discussed, primarily those occurring in Manitoba, include those affecting alfalfa, clovers, and other legumes, cereals, and a few other crop plants.

Plant diseases and pests in Denmark, 1924 [trans. title], E. Gram and S. Rostrup (*Tidsskr. Planteavl, 31 (1925), No. 3, pp. 353–417, figs. 2; Eng. abs., pp. 414–417*).—This report, which covers the year ended September 30, 1924, includes an account of some insect injuries, as well as a number of diseases of plants. The latter include barley stripe (*Pleospora graminea*), wheat naked smut (*Ustilago tritici*), and oat nematodes (*Heterodera schachtii avenae*); beet mosaic; swede and cauliflower bacteriosis (*Bacterium maculicolum*); potato wart (*Synchytrium endobioticum*) and late blight (*Phytophthora infestans*); clover (?) *Ascochyta trifolii* and clover nematode disease (*Tylenchus devastatrix*); grass snow mold (*Fusarium* spp.); apple and pear rot (*F. willkommii*); gooseberry mildew (*Sphaerotheca mors-uvae*), also a disease associated with *Gloeosporium ribis* and *G. curvatum*; and hyacinth diseases (*Phytomonas hyacinthi* and *Cephalosporium asteris*).

Annual report of the mycologist for 1924, A. Sharples (*Malayan Agr. Jour., 13 (1925), No. 7, pp. 214–219*).—This report deals chiefly with major investigations on diseases of rubber and of oil palm and coconut palm, mention being made also of minor investigations on a few other plants.

Tumor formation in Bryophyllum, E. F. Smith (*Jour. Heredity, 16 (1925), No. 8, p. 272, fig. 1*).—A photograph is submitted to show that one successful inoculation on *B. calycinum* with the hop strain of *Bacterium tumefaciens* does not protect from a second inoculation with the same strain. Both tumors were still free from necrosis, the older being nearly two years old and the younger over five months.

Parasitism of Cuscuta reflexa (Roxb.), J. THOMSON (*Nature [London], 116 (1925), No. 2906, p. 66*).—The hyphae of this dodder are differentiated into strands of tracheids when they meet the xylem vessels of the host. Those entering the host phloem are not modified; moreover, the shaft of the haustorium contains no sieve tubes. Irritation set up by the haustorium stimulates all the living cells in its neighborhood to active cell-division. In woody host stems the radius of the stem of the host on the side invaded by the parasite is increased. Connection with the host xylem is maintained by the differentiation into tracheids of young parenchyma cells at the tip of the haustorium. The dodder grown on peeled stems can live on material derived from the host's wood even when its chlorophyll is prevented from functioning by inclosure in a light-tight box. Haustoria then formed are perfectly normal although smaller.

Fusarium as a cause of plantlet diseases [trans. title], O. APPEL (*Angew. Bot., 6 (1924), No. 2, pp. 48–50*).—Results of research credited to the elder Appel are briefly noted as having to do with stem diseases (principally near ground level), and their causal organisms, among which the so-called snow mold, *F. nivale*, is important.

The relations of Fusarium to other fruiting forms [trans. title], J. FUCHS (*Ztschr. Pflanzenkrank., 34 (1924), No. 5–6, pp. 193–220, figs. 7*).—Of the two Fusariums here reported as studied, Fusarium α is said to be connected with Volutella, Frusarium β with Verticillium. The forms Acrostalagmus, Spicaria, and Verticillium are not separable as definite genera. Fusarium, as a genus, is regarded as not more definite.

Some protein analogies of the mycelium of Fusarium lycopersici, I. T. SCOTT (*Missouri Sta. Research Bul. 92 (1926), pp. 44, figs. 9*).—The author claims that "when the living mycelial mats of the fungus, *F. lycopersici*, are added to dilute buffered and unbuffered single-salt solutions at different reactions and the change in hydrogen-ion concentration is followed by means of electrometric or colorimetric methods the reaction is changed in every case to a final equilibrium point at or near a Sorensen value of 5.4. Dead mycelium does not give as consistent results as the living, but suggests that it possesses an equilibrium point different from that for the living mycelium. Spore germination studies indicate that the toxicity of certain deleterious ions like the cations, mercuric, cupric, and basic dye—methylene blue—is greater in solutions more alkaline than pH 5.4; while the anions, cyanide and acid dye-eosin—show greatest toxicity in solutions more acid than pH 5.4. The simplest explanation of the observed phenomena that might be offered is that the living tissue of *F. lycopersici* behaves in a manner analogous to an amphoteric protein colloid, like gelatin, with an isoelectric point in the neighborhood of pH 5.4."

Culture studies with rust fungi [trans. title], H. KLEBAHN (*Ztschr. Pflanzenkrank., 34 (1924), No. 7–8, pp. 289–303*).—Since the publication of reports previously noted (E. S. R., 45, p. 144), the author has continued his experimentation, and in the present article he contributes on the susceptibility of pines to *Peridermium pini*, *Cronartium asclepiadeum* on pine, teleutospore hosts and overwintering of *C. ribicola*, specialization of *Coleosporium tussilaginis*, habituation of gooseberry rust (*Aecidium grossulariae*) to *Ribes nigrum*, study of mallow rust (*Puccinia malvacearum*), certain wheat and grass rusts, *P. menthae*, and cultures of rust fungi on artificial media.

Holcus bacterial spot of Zea mays and Holcus species, J. B. KENDRICK (*Iowa Sta. Research Bul. 100 (1926), pp. 301–334, figs. 5*).—A description is given of a leaf-spot disease of sorghum, broomcorn, Sudan grass, Johnson grass, corn, pearl millet, and foxtail, caused by *Pseudomonas holci* n. sp., or *Bacterium holci* n. sp. The disease on the Holcus species is said to be character-

ized by light centered, red bordered, round, elliptical lesions on the leaves. The very small lesions are red throughout. It is said that often the spots are so numerous as to cause the death of the entire leaf. Field observations and greenhouse inoculations showed as hosts for the disease 22 varieties of sorghum and broomcorn, Sudan grass, Johnson grass, and pearl millet; 20 varieties of corn; and foxtail. The causal organism is said to be a white fluorescent, cylindrical, polar flagellate bacterium, a technical description of which is given. The organism is said to be carried over winter in or on sorghum seed, and some evidence was obtained which indicates that it may also overwinter in the soil. No evidence was found of the organism being carried over on the seed of corn, and the initial infection on this host is believed to come from the soil or from other hosts growing in close proximity.

As a control measure, the author recommends the selection of Holcus seeds from fields free from the disease, the destruction of volunteer plants growing in or near corn fields, and crop rotations.

Terminology of the Uredinales, J. C. ARTHUR (*Bot. Gaz., 80 (1925), No. 2, pp. 219–223*).—"If the emphasis in thinking of the rusts is placed upon the mycelial body and the fruit forms or sori which it bears in unvarying order, instead of upon the spore forms and their accessories, there should be no difficulty in apprehending the simplicity of the new terms and their suitableness for every possible situation, whatever bewildering likeness the spores and their accessories may sugggest."

[Studies on the fungicidal activity of sulfur], E. VOGT (*Angew. Bot., 6 (1924), No. 2, pp. 276–300, figs. 2*).—Under conditions of light, air access, and humidity, elemental finely divided sulfur is not oxidized to SO_2, nor is it reduced to H_2S. Vaporization of sulfur is very slight, even under conditions of very fine division and highest natural temperatures. The precise action of sulfur as a fungicide was not discovered in this experimentation.

Chemotherapeutic tests of Kalimat and Fungolit [trans. title], I. ESDORN (*Angew. Bot., 6 (1924), No. 2, pp. 105–112*).—These experiments as tabulated and briefly discussed deal with the spreading, curative, and toxic effects.

Inheritance studies in cereals (*Washington Col. Sta. Bul. 208 (1926), p. 26*).—Tests are reported of inheritance studies by E. F. Gaines on the resistance of 238 varieties of wheat to bunt and 43 varieties of oats to covered smut, in which a large number of wheat varieties maintained their immunity and several oat varieties appeared immune. In the third generation cross between the oat varieties Markton and Banner 214 families were tested, and 144 of them produced no smut, the others showing from a trace up to 31 per cent infection.

Recent studies on the life history and control of oat loose smut [trans. title], ZADE (*Angew. Bot., 6 (1924), No. 2, pp. 113–125*).—Noting certain inconsistencies among control experiments with loose smut (*Ustilago avenae*) of oats under laboratory and under field conditions, the author details with discussion observations on the behavior of this fungus toward other species of Avena.

Stinking smut control in Uruguay [trans. title], G. J. FISCHER (*Angew. Bot., 6 (1924), No. 2, pp. 125–140, fig. 1*).—Formalin and copper sulfate were found to retard germination of oats, copper-lime less, and Uspulun not at all. Formalin kills about 25 per cent of the viable seeds, copper sulfate less, copper-lime still less, and Uspulun none. Other effects are detailed.

Smut-control test (*Utah Sta. Bul. 198 (1926), p. 22*).—In a comparison by A. F. Bracken it is claimed that for the control of smut formalin and copper sulfate were both slightly more efficient than copper carbonate. In the yield test, in which no treatment, copper carbonate, copper sulfate, and formalin

were compared, no significant differences were shown, since the wheat emerged soon after drilling.

[Acidity and rust resistance], O. ARRHENIUS (*Ztschr. Pflanzenkrank., 34 (1924), No. 3-4, pp. 97-101*).—A study is reported regarding a possible relation between resistance to wheat yellow rust and the actual and potential acidity of cell sap and tissue, designating various summer and winter wheats as having been tested. No such relation was established.

The inheritance of resistance to black stem rust in crosses between varieties of durum wheat, J. B. HARRINGTON (*West. Canad. Soc. Agron. Proc., 5 (1924), pp. 20-35, figs. 5*).—In this investigation, regarding which an account as to the greenhouse technique, the differential varieties, and the rust strains has been given in a paper previously noted (E. S. R., 49, p. 840), a study was made of the parasitic capabilities of four biologic strains of *Puccinia graminis tritici* on F_3, F_4, and F_5 progeny from crosses between the three varieties of *Triticum durum*, Kubanka No. 8, Mindum, and Pentad, involving the inoculation of 23,620 hybrid seedlings and 3,680 seedlings of parental varieties. The varietal details are indicated.

Reaction to rust was inherited in the same manner as were other characters. Several factors appeared to have been involved, environmental influences modifying the expression of rust reaction. Fairly satisfactory agreement was found between the rust results in the greenhouse one year and those of the next year. It is considered necessary to use larger numbers of seedlings to determine accurately the genetic class of any particular family. No relation was found to exist between rust reaction and seed color. The nursery results indicated the presence of more than one genetic factor difference for each of the characters nursery rust reaction, erectness of plant, and earliness of heading. There seemed to be a slight linkage between the inherited factors governing resistance to rust under field conditions, plant height, erectness of plant, and time of heading. The hybrids that resembled Pentad in rust reaction also tended to show resemblance in other characters.

Sulphur dust for rust control, C. G. SELVIG (*Minnesota Sta., Crookston Substa. Rpt. 1925, p. 33*).—A report is given of trials made to determine the value of sulfur for controlling black stem rust of wheat. The wheat was dusted with precipitated sulfur at 4-day intervals. Based on these and other trials, it is concluded that under certain conditions one dusting with precipitated sulfur will control stem rust, even in the presence of a severe epidemic. Several dustings at 4- or 5-day intervals, applied at the right time, are considered necessary to insure rust control. The dust seemed to have very little residual effect, and the best results were obtained when the first dusting was applied about flowering time and continued until the wheat had reached the hard dough stage.

Montana's barberry campaign, H. E. MORRIS and W. L. POPHAM (*Montana Sta. Bul. 196 (1926), pp. 24, pl. 1, figs. 7*).—After giving an account of the black stem rust of wheat and the relation between the barberry and wheat stem rust, a summary is given of the work done in the barberry eradication campaign in the State. The most satisfactory method of eradication is said to be the use of crushed rock salt or kerosene applied about the bushes.

The influence of high temperatures during and after seed grain treatments [trans. title], W. NAGEL (*Angew. Bot., 7 (1925), No. 5, pp. 304-319, fig. 1*).—A detailed, tabular, and graphical account is given of trials with several much-used fungicides against *Tilletia tritici* on seed wheat at different elevated temperatures, and the apparently different influences of such temperatures.

Stamping out the koleroga of areca, M. J. NARASIMHAN (*Mysore Agr. Calendar, 1926, pp. 25, 26*).—Preventive measures against koleroga (*Phytoph-*

thora sp.) of areca nut as carried on for some years gave encouragement resulting in attempts to eradicate the disease. Lack of complete cooperation and the presence of field hosts (*Bryophyllum calycinum*) discouraged the hope of complete eradication, leaving, as the only practical alternative, spraying work as a regular routine operation.

[A bean fusariosis], M. Benlloch and J. del Cañizo (*Bol. Estac. Patol. Veg. [Inst. Agr. Alfonso XII, Madrid], 1 (1926), No. 1, pp. 2–7, figs. 5*).—A disease affecting bean plants (*Phaseolus vulgaris*), which show on transverse section of base or root a clogging of the vessels, is said to be associated with the abundant occurrence of a fungus. The characters of this are described as relating it to the species *Fusarium martii*, possibly the variety *F. martii pisi* described as a new variety by Jones (E. S. R., 50, p. 839).

The relation of black rot to the storage of carrots, J. I. Lauritzen (*Jour. Agr. Research [U. S.], 33 (1926), No. 11, pp. 1025–1041, figs. 4*).—A report is given of a study of a black rot of carrots caused by *Alternaria radicina*, especial attention having been given to the temperature relations of the fungus. The optimum temperature for infection and decay of carrots by *A. radicina* is said to be about 28° C., with an infection range of from —0.6 to 34°. For the control of black-rot disease, it is recommended that carrots be stored at temperatures of from 0 to 2°, thus reducing the amount of infection and decay to a minimum. Little varietal difference was observed in resistance to the fungus when inoculated into carrot roots, but there was some difference in susceptibility when the roots were dipped into suspensions of the spores.

Efforts to determine the means by which the cotton-wilt fungus, Fusarium vasinfectum, induces wilting, H. R. Rosen (*Jour. Agr. Research [U. S.], 33 (1926), No. 12, pp. 1143–1162, figs. 3*).—The claim that wilting of cotton, cowpeas, and watermelons was due to the plugging of the vascular system by the fungus (E. S. R., 11, p. 944) having been questioned in the case of diseases of other plants caused by species of Fusarium, the author made a study of *F. vasinfectum* in relation to the wilting of cotton plants.

A report is given of a large number of experiments, in which pure cultures of different strains of the cotton-wilt fungus were grown on various liquid media, the fungus removed, and toxicity studies undertaken with the filtrates by placing cotton plants in them. When whole plants with root systems carefully handled were placed in filtrates of *F. vasinfectum*, wilting ensued as with plants that were freed from roots. Microscopic observations of the vascular elements of wilted cotton plants are said to have clearly indicated that wilting was not due to mechanical plugging of the vessels by the fungus. The author concludes that filtrates of *F. vasinfectum* growing on Richards' solution possess at least two substances poisonous to the cotton plant. One is said to be a volatile compound with an alkaline reaction and the other an inorganic salt in the form of nitrite. The wilting of cotton infected with *F. vasinfectum* is considered to be due to poisonous chemical substances formed by the fungus.

[Occurrence of corn ear rots in given areas and the effect which ear rots may have upon the constituents of affected ears], A. N. Hume (*South Dakota Sta. Rpt. 1925, pp. 13, 14*).—Numerous ears of seed corn selected on the basis of appearance of disease on the kernels and ears were studied, and as a result of the original inspection of these ears the presence of several apparently distinct diseases was discovered. Several correlations were established, one of which reveals the positive correlation between percentage of germination and yield in nursery rows of several seed ears, and another between the final stand of corn in the field with relation to yield per acre.

As a part of this investigation, P. Danielson made a detailed study of normal and abnormal corn plants, in which all nodes and internodes were analyzed

separately for total ash, nitrogen, phosphorus, potassium, calcium, iron, aluminum, and silica. Normal plants were found to have different selective powers for the various ash constituents, and no two plants seemed to have any correlation in the distribution of the elements absorbed. Normal plants were found to contain a higher average percentage of phosphorus, calcium, and silica than abnormal ones. Abnormal plants showed a marked difference in their selective powers and contained a much higher average percentage of ash than normal ones, being particularly higher in iron, aluminum, and potassium. When all abnormal plants were considered, no large accumulations of iron or aluminum or other elements were found in any particular portion of the plants. However, when individual abnormal plants were observed, large accumulations were found in certain nodes and internodes, which did not seem to be correlated with any particular character found in the plant. Discolored nodes and internodes in plants apparently affected with rots did not appear to be correlated with a higher percentage of iron or aluminum.

The influence of plant injury and the root rot diseases upon the physical and chemical composition of corn grain, G. H. DUNGAN (*Illinois Sta. Bul. 284 (1926), pp. 253–281, figs. 9*).—In a previous publication Trost called attention to the greater infection by root rots of seedlings from ears of corn, the grain of which was of a starchy nature, than from those with a horny endosperm (E. S. R., 47, p. 447), and Holbert et al. reported upon correlations of certain seed characters of corn and susceptibility to root rot attack (E. S. R., 52, p. 245).

No explanations of the reasons for this behavior having been offered, the author made a study of the influence of some environmental characters upon the quality of grain produced. In one series of experiments stalks and shanks of ears were broken but not severed when the grain was in the milk stage, and in another series when the grain was in the soft-dough stage. In other experiments seed of the same variety of corn, which had starchy and horny endosperms, was inoculated with *Diplodia zeae*, *Fusarium moniliforme*, *Gibberella saubinetii*, and *Rhizopus* spp. and the effect noted on the grain produced.

Constricting the ear shanks and stalks of corn by breaking the supporting tissue without completely severing the vascular elements was found to have the same effect upon the yield and composition of corn grain as premature harvesting. Breaking the shanks when the ears were in the soft-dough stage caused the greatest chaffiness in the grain. Chemical analyses showed that there was no definite correlation between kernel starchiness and quantity of starch in the grain, as has been commonly supposed. The percentage of total nitrogen, hemicellulose, and nonhydrolyzable material was distinctly higher in grain from ears produced on broken shanks than in grain from ears produced on sound shanks. The mutilation of the shanks, on the other hand, resulted in a greatly reduced proportion of ether extract and starch in the grain.

Inoculation of the seed at planting time with corn-root organisms resulted in the production of grain having a specific gravity of 0.027 lower than that from the adjoining uninoculated plants. Samples of grain produced by plants that grew in inoculated hills absorbed an average of 5.78 per cent more water than samples from plants growing in uninoculated hills. Chemical analyses did not show any significant differences between the grain produced in the inoculated and uninoculated hills. There was slightly more nitrogen, on the average, in the corn from inoculated seed and a little less ether extract and total sugar.

Analyses of two lots of horny and two lots of floury corn of the Leaming variety showed that there was no significant difference in the chemical composition between these two types of corn. Upon germination, however, the horny corn was found to contain a greater proportion of soluble starch and dextrins

than the floury corn, and starch digestion in the horny corn was somewhat more rapid than in the floury corn. This is believed to offer an explanation for the superior vigor of seedlings from horny corn.

[**Peppermint and peppermint rust**], H. Ross (*Ztschr. Pflanzenkrank., 34 (1924), No. 3–4, pp. 101–107*).—A study is reported of peppermint as subject to attack by the rust fungus, *Puccinia menthae*, concluding with the claim that proper nutrient and moisture conditions, with correspondingly correct stand, lessen attacks of peppermint by *P. menthae*.

Potato diseases and their control, M. F. Barrus and C. Chupp (*N. Y. Agr. Col. (Cornell) Ext. Bul. 135 (1926), pp. 3–123, figs. 36*).—The authors describe and, so far as definite means are known, offer suggestions for the control of potato diseases.

Tuber disease control, C. G. Selvig (*Minnesota Sta., Crookston Substa. Rpt. 1925, p. 52*).—Hot formaldehyde and corrosive sublimate were compared for the control of potato scab and Rhizoctonia, but the yields were so interfered with by water that no data were secured. However, in rotation experiments in which tubers were treated with hot formaldehyde, it was found that a 2-year rotation was too short to control black scurf and potato scab, and the large amount of manure applied appeared to be conducive to the development of scab.

Summarizing the results of experiments on seed treatment, the author claims that the treatment of seed potatoes proved profitable every year tried. For the years 1922–1924 the average annual increase in yield from the corrosive sublimate treated tubers was 44.1 bu. per acre, and from hot formaldehyde 41.4 bu. Tuber disease control was not absolute, but the percentage of disease-free seed in 1924 from the treated seed is said to average 90 per cent as compared with 65 per cent for untreated seed.

Bordeaux spraying test [with potatoes], C. G. Selvig (*Minnesota Sta., Crookston Substa. Rpt. 1925, p. 51*).—In an experiment designed to test the relative effectiveness of early summer and late summer spraying, so much injury was done to the plats by water that the project was abandoned and only the effect of three standard sprayings of Bordeaux mixture and calcium arsenate was noted.

Bordeaux mixture was effective in controlling early blight and potato flea beetles, and excellent results were obtained from sprayed plats uninjured by water. Potato vines were kept green and growing until the end of the season. The author states that the increase in yield of potatoes from the use of three applications of Bordeaux mixture has varied during a 5-year period from 7.35 to 82 bu. per acre, with an average of 25.08 bu. As a result of 15 years' experiments, three sprayings with Bordeaux mixture proved most profitable, except in two years when potato leafhoppers were very abundant. Additional late sprayings proved profitable under these conditions.

Phytophthora tuber rot of seed potatoes [trans. title], H. Zimmermann (*Angew. Bot., 6 (1924), No. 2, pp. 51–53*).—At the Rostock Experiment Station potato seed tubers all more or less affected with *P. infestans* were planted May 4 in soil of moderate fertility supplied with fertilizers named and kept moderately moist by weather conditions. The results are tabulated as to returns and disease on the crop tubers. From severely diseased plantings the crop tubers were nearly all sound, while from slightly infected plantings the crop tubers were disease-free with better (heavier) individual classified and total tubers. It is thought that keeping the seed tubers dry was a factor in keeping down Phytophthora.

Potato and tomato diseases, M. W. Gardner (*Ind. Hort. Soc. Trans., 1924, pp. 121–132*).—A brief account is given of Indiana potato diseases, including

Fusarium wilt, early blight, blackleg, black scurf, scab, mosaic, and leaf roll; also of tomato diseases, including Fusarium wilt, Septoria leaf spot, early blight, bacterial spot, mosaic, and leaf mold. Late blight of potatoes does not occur, but Bordeaux mixture is used to prevent hopperburn. Mosaic is the worst disease of early potatoes, spreading in the field and killing the plants. Leaf roll is the worst disease of the late potato crop. Both diseases can be avoided by the use of northern-grown certified seed. Tomato Fusarium wilt has been widely distributed by the use of southern-grown plants. Septoria leaf spot is very destructive in wet seasons, though controllable by the use of Bordeaux mixture on the plant bed and in the field. Seed disinfection is controlling bacterial leaf spot. Mosaic is not seed borne but persists perennially in certain weeds, which can easily be eradicated from the plant beds. A microscopic study of tomato mosaic shows that scattered groups of cells are killed, the surrounding cells being stimulated to grow and divide, producing tumorous growths, accompanied in the fruits by surface blisters and abnormal adhesions between the fruit wall and the seed pulp, with various forms of injury. The leaf mold fungus invades the stem end of the fruit, causing a black rot. This results in a much earlier infection of the sepals, torus, or pedicels. The seeds are invaded, and they transmit the fungus.

Striga lutea on rice in Sumatra [trans. title], B. T. PALM and C. HEUSSER (*Ztschr. Pflanzenkrank., 34 (1924), No. 1–2, pp. 11–18, figs. 4*).—*S. lutea*, here said to be one of the most widely distributed and injurious of parasitic plants, is discussed as to its root relations with rice plants, also as to its relations with numerous other hosts named.

Control of sugar-beet nematode by crop rotation, G. THORNE (*U. S. Dept. Agr., Farmers' Bul. 1514 (1926), pp. II+21, figs. 15*).—A popular summary is given of the results of seven years' field investigations of the sugar-beet nematode in the Western States. After a brief discussion of the distribution of the nematode, its life history, common sources of infestation, and host plants, practical methods of control are outlined. Where only a few fields are infested, it is recommended that these should be planted with other crops and beets not grown again on these infested areas. In sections where the infestation is general, suitable crop rotations are recommended.

[Sweet potato diseases at the Prosser (Wash.) Substation] (*Washington Col. Sta. Bul. 208 (1926), pp. 60, 61*).—Experiments with sweet potatoes, by H. Jensen, are said to have offered an opportunity to observe the effect of adverse climatic conditions on the susceptibility of sweet potato varieties to diseases. It was found that all slow growing and small, open foliaged varieties were more susceptible to Pythium than the rapid growing, heavy foliaged varieties. In the slow growing varieties in the experiment the disease almost checked plant growth, and extreme heat with a continuously dry atmosphere also affected the plants unfavorably. The rapid growing varieties were less injured by dry, hot weather. Stem rot is reported to have made its appearance in the State for the first time, and the variety Nancy Hall proved very susceptible to this disease, while Triumph, Strassburg, and some others were practically immune.

A strain of Yellow Jersey sweet potato resistant to surface rot (Fusarium oxysporum), J. I. LAURITZEN (*Jour. Agr. Research [U. S.], 33 (1926), No. 11, pp. 1091–1094*).—A description is given of Improved Yellow Jersey, a variety of sweet potato of unknown origin that is said to be resistant to surface rot. In addition to its disease resistance, the roots do not shrivel as much in storage as the ordinary variety from which the strain was selected.

Two important tomato diseases and their control, S. H. Essary (*Tennessee Sta. Circ. 8 (1927), pp. 4, figs. 2*).—Popular accounts are given of the wilt, or blight, and leaf spot of tomatoes, and suggestions are given for their control. The use of resistant varieties of tomatoes for the prevention of wilt and spraying for the prevention of leaf spot are recommended.

Tomato diseases in Florida, G. F. Weber and G. B. Ramsey (*Florida Sta. Bul. 185 (1926), pp. 57–138, figs. 42*).—The author has brought together for the benefit of growers information regarding tomato diseases known to occur in Florida. About 30 diseases are described, their causes are indicated when known, and suggestions are given for their control so far as definite treatments can be recommended.

A stem-end and center rot of tomato caused by various unrelated organisms, N. A. Brown (*Jour. Agr. Research [U. S.], 33 (1926), No. 11, pp. 1009–1024, figs. 5*).—The author reports that a stem-end and center decay is responsible for heavy losses in shipments of green tomatoes. It is claimed that the disease can scarcely be detected on the outside of the fruit, while the central core, including portions of the seeds, is a mass of hard, dark tissue. The disease occurs usually during seasons of hot weather and abundant rain, or during weather in which the fruit expands too rapidly after a period of checked growth. It is claimed that there is always an organism present which is responsible for the decay. The organisms which produced the decay readily proved to be *Bacterium malvacearum*, *B. marginale*, *B. tumefaciens*, *B. savastanoi*, *B. campestre*, *B. viridilividum*, *Cladosporium* sp., *Septoria gladioli*, *Verticillium* spp., *Fusarium moniliforme*, and *Alternaria* sp. In addition, inoculation experiments showed the disease might be produced with difficulty by *B. citri*, *B. vitians*, *Bacillus coli communis*, and *B. mycoides*. The author claims that the blossom-end rot of tomatoes, considered by pathologists to be a physiological disease induced by irregularities in the water supply and not by parasites, was produced by inoculating tomatoes with some of the above organisms.

A tomato fruit rot caused by Bacterium lycopersici n. sp. [trans. title], G. Burgwitz (*Ztschr. Pflanzenkrank., 34 (1924), No. 7–8, pp. 303–312*).—A description is given of a hothouse tomato fruit rot observed during 1923 and of a study of the associated organism, which is considered as a new species and is named *B. lycopersici*. Varieties known to be attacked include, thus far, Earliana and Alice Roosevelt, Danish Export remaining entirely unaffected though exposed. Apparently, the organism can overwinter in outdoor soil.

Tomato late blight and its relation to late blight of potato, A. Berg (*West Virginia Sta. Bul. 205 (1926), pp. 31, figs. 7*).—From his investigation the author claims that the *Phytophthora infestans* which produces late blight of tomato differs biologically from the form which produces potato blight. The potato fungus was found to infect the tomato fruit and leaves under artificial conditions, but the fruit could not be infected with this strain unless the epidermis was ruptured. The period of incubation for the potato strain, when inoculated on tomato plants, proved to be shorter than that of the tomato strain on the same host, and vice versa. In all cases observed under natural conditions, potato late blight is said to have appeared earlier in the season than the tomato late blight, and wherever tomato late blight was found potato late blight also occurred in close proximity.

Disease resistant fruits and vegetables, C. T. Gregory (*Ind. Hort. Soc. Trans., 1924, pp. 118–121*).—A list is given of disease resistant varieties of bean, celery, asparagus, cabbage, radish, spinach, tomato, muskmelon, apple, peach, raspberry, and strawberry.

Studies of the epidemiology and control of apple scab, G. W. KEITT and L. K. JONES (*Wisconsin Sta. Research Bul. 73 (1926), pp. 104, pls. 6, figs. 9*).—In order to arrive at definite recommendations for the control of apple scab, the authors conducted field studies of the disease in relation to the natural environment and laboratory and greenhouse studies of the development and prevention of the disease under controlled conditions.

Field studies are said to have shown that moisture and temperature factors play a leading part in the severity of the disease and the difficulty of its control. Experiments on spore germination under controlled conditions indicate that infection occurs at temperatures ranging from 6 to 26° C., with the temperature most favorable for rapid development near 20° (68° F.) Abundant infection was found to occur following suitable periods of intermittent wetting. The investigations of the authors confirm previous reports that apple leaves and fruits were more susceptible to scab in the early stages of development than at later periods.

Under Wisconsin conditions, the apple scab fungus was found to overwinter to a significant extent only through the formation of the perithecial stage in dead leaves. Discharges of spores occurred only when the leaves bearing the ascocarps were wet. A severe drought in early spring delayed the discharge and reduced the quantity of ascospores produced. In the six seasons studied primary infection commonly occurred during the first sufficient rain period following the exposure of susceptible host tissue in the unfolding fruit buds. The most critical period for the development of apple scab epidemics was found to extend from the time the apical parts of the sepals were first exposed in the unfolding fruit buds until an indefinite time some two or four weeks after petal fall.

Control experiments conducted during the years 1919–1924, inclusive, in which Bordeaux mixture, liquid lime sulfur, dry lime sulfur, and various mixed programs of Bordeaux mixture and liquid lime sulfur were tested, showed that Bordeax mixture or liquid lime sulfur, appropriately applied, ordinarily controlled the disease. Bordeaux mixture, however, was unsatisfactory commercially because of injury to fruit and foliage. Liquid lime sulfur, 1–40, appeared to be the most satisfactory spray tested. Data are given as to the time and number of applications of spray tentatively recommended under different climatic conditions.

[Apple tree scab and weather], H. BREMER (*Angew. Bot., 6 (1924), No. 2, pp. 77–97, figs. 2*).—Observations credited to R. Aderhold and R. Ewert, as carried on during 10 years, of the severity of apple scab (*Fusicladium dendriticum*) show that the most influential factor is precipitation. The most critical month is May, particularly its first 10 days, the disease showing great severity in case of heavy rainfall during this short period.

Apple harvesting [in relation to internal browning] (*Utah Sta. Bul. 198 (1926), pp. 50, 51*).—Investigations by T. H. Abell are reported, in which an effort was made to determine whether or not delayed harvesting causes internal browning of the Jonathan apple. About 20 apples were picked from plats at weekly intervals, beginning two weeks before and continuing until three weeks after commercial harvest. The apples were stored in a cellar until May or later. The first year's results are said to indicate that internal browning is more abundant in Jonathan apples raised on well-drained bench soils, and is practically nonexistent on those grown in richer, more retentive soils. It was increased by leaving the fruit on the tree one week too long, and could have been avoided by harvesting one week earlier without sacrificing much in red color. Water core is said to have been serious in extremely late pickings, but the amount was not so clearly correlated with the time of earlier pickings.

Coryneum blight of stone fruits, C. S. PARKER (*Howard Rev., 2 (1925), No. 1, pp. 3–40, pls. 5*).—Coryneum blight of stone fruits is said to have become important in the State of Washington, and to have been reported from a number of peach-growing sections of the United States east of the Rocky Mountains since its first appearance on the Pacific coast in 1900. The present paper reports several experiments with the organism (*C. beijerinckii*) responsible for the disease as studied on peach, apricot, and cherry. Blossom, leaf, and twig blight are dealt with.

Artificial inoculations and reisolations reproduced all typical phases of the disease. No indication of any other than the summer or conidial stage was found. Infection occurs only through stomata or ruptured epidermal tissue. A supposedly separate strain of *C. beijerinckii* is noted. Spores were not killed by desiccation, and it is believed that they resist unfavorable conditions for a long period.

Heart rot of gladioli and its control [trans. title], H. PAPE (*Gartenwelt, 29 (1925), No. 40, pp. 676–680, figs. 4*).—Gladiolus heart rot (*Septoria gladioli*) is described as seen in bulbs of gladiolus sent in 1925 from Stuttgart and Bonn.

A leaf disease in Primula obconica [trans. title], H. PAPE (*Angew. Bot., 6 (1924), No. 2, pp. 255–275, pls. 2, figs. 2*).—A leaf-blade disease affecting a few to all leaves of the plant *P. obconica* is described as to macroscopic and microscopic characters. Neither pest nor disease organism could be made out in this connection. Studies on causation as outlined included chemical soil constituents, temperature, and sulfuric acid (or SO_2) gas in the atmosphere, the presence of which, under certain conditions, is regarded as capable of causing such leaf injury.

Oak mildew [in Russia] [trans. title], A. BUCHHEIM (*Ztschr. Pflanzenkrank., 34 (1924), No. 1–2, pp. 1–11, figs. 4*).—Oak mildew, which was found in almost all European countries in 1907 and 1908, and which became widely distributed in Russia during 10 to 15 years preceding 1923, has been made the object of study as to both its morphology and its biological relations. The forms of the causal organism studied by the author have been referred to the comprehensive species *Michrosphaera alni*, with comment on biological grounds regarding its inclusion under *M. quercina*. No morphological differences were distinguished between the conidia of the organism on oak and of those on beech.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The Manchurian wapiti (Cervus xanthopygus Milne-Edwards) [trans. title], N. A. BAĬKOV (BAIKOFF) (*Obshch. Izuch. Man'chzhursk. Kraiā Otd. Izd. (Manchuria Research Soc. Misc. Papers), Ser. A, No. 5 (1925), pp. 14, figs. 11; Eng. abs., p. 14*).—This is an account of the species of deer met with in Manchuria, Chosen, Transbaikalia, the Amur, and the Maritime Provinces.

The fauna of British India, including Ceylon and Burma.—Birds, E. C. S. BAKER, edited by A. E. SHIPLEY (*London: Taylor & Francis, 2. ed., 1922, vol. 1, pp. XXIII+479, pls. 8, figs. 98; 1924, vol. 2, pp. XXIII+561, pls. 8, figs. 86; 1926, vol. 3, pp. XX+489, pls. 8, figs. 90*).—This is a second edition of a work in four volumes, the first two of which, published in 1889 and 1890, were by Oates, under the editorship of W. T. Blanford, and the two last, published in 1895 and 1898, were by Blanford. The present three volumes are devoted to and complete the order Passeres, in which are included 33 families, 303 genera, and 1,336 forms.

A natural history of the ducks, J. C. PHILLIPS (*Boston: Houghton Mifflin Co., 1925, vol. 3, pp. IX+383, pls. 56*).—In this third volume of the work previously noted (E. S. R., 50, p. 355) the author concludes his account of the [illegible]

A monograph of the pheasants of Japan, including Korea and Formosa, N. KURODA (*Tokyo: Author, 1926, pp. [3]+43, pls. 15*).—In this work the author deals with 12 forms belonging to the genera Phasianus, Graphophasianus, and Cyanophasis. A list of 72 references to the literature is included.

The snakes of Iowa, J. E. GUTHRIE (*Iowa Sta. Bul. 239 (1926), pp. 145–192, figs. 69*).—In this account the author deals with the classification, including a key for identification, of the snakes occurring in Iowa, their life histories and habits and economic importance. Descriptions are given of the 25 forms which occur in the State, of 2 additional species from nearby States, and of the banana boa, photographs of many of which are reproduced. It is pointed out that the bull snake, fox snake, milk snake, king snake, and blue racer are Iowa's most valuable snakes because their chief food consists of rats, mice, ground squirrels, and pocket gophers. The two species of rattlesnakes are the only poisonous forms occurring in Iowa.

Annual report of the division of entomology, H. L. DOZIER (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt., 1925, pp. 115–124; also in Spanish ed., pp. 121–129*).—This is a report of observations of the occurrence of insects during the year, and of the work conducted.

In control work with white grubs third-instar larvae of *Lachnosterna portoricensis* placed in soil in cages were killed to the extent of 75 per cent through the application of a carbon disulfide emulsion, 75 cc. in 12.5 qt. of water, sprinkled over the soil. In a check cage adjoining, the natural mortality was 32 per cent. In studies of the sweet potato bug (*Corecoris* (*Spartocera*) *batata* Bbr.) it was found to be killed by a fungus, *Sporotrichum gloeosporoides*. The first nymphal instar of this bug required about eight days, in November, for its completion. Notes are presented on *C. fusca* Thumb., of which a number of nymphs in various instars were found on cundeamor vine in November. Reference is made to the rearing of the tachinid fly *Trichopoda pennipes* from the last nymphal instar of *C. batata*. Outbreaks of the striped grass looper (*Mocis* (*Remigia*) *repanda*) occurred in various sections of the island, causing damage to malojilla grass and young sugar cane in October and November, but it was eventually controlled by parasites. The yellow cane aphid (*Sipha flava*) caused serious injury to Uba cane, but was controlled by the use of a 3 per cent nicotine dust. The lesser corn stalk borer was a source of injury to 2-months-old Uba cane at Buena Vista. Scale insects were not prominent pests due to the natural control by parasites. The species mentioned include the purple scale, West Indian rufus scale (*Selanaspidus articulatus*), snow scale (*Chionaspis citri*), soft brown scale (*Coccus hesperidum*), pustule scale (*Asterolecanium pustulans*), tessellated scale (*Eucalymnatus tessellatus* (Sign.)), and black scale. *Pulvinaria iceryi* was a source of injury to sugar cane in one locality. The cloudy- winged whitefly was found infesting sour-orange foliage in private home gardens. An efficient parasite, *Encarsia* n. sp., was reared in abundance from *Metaleurodicus minimus* on *Cestrum diurnum* and guava, and from *Aleurodes variabilis* Quaint. on *Carica papaya*. Large numbers of the small chalcid parasite *Eretmocerus californicus* How. were reared from the woolly whitefly. The occurrence of this parasite is thought to account for the comparatively small damage caused by this whitefly. The red-banded thrips were abundant throughout the year, damaging many different host plants, including the grape, achiote, mango, almendra, guava, etc. Reference is made to the rearing of some 7,000 silkworms during the year and the indication that they can be profitably raised on the island, particularly in view of the fact that the white mulberry is considered to be about the best shade tree for coffee.

Insect pests (*South Carolina Sta. Rpt. 1926, pp. 31–41, figs. 4*).—Brief reference is made to studies of cotton insects, including the boll weevil, cotton flea

hopper, leafhopper, and boll worm; corn billbug; insecticides; Mexican bean beetle; rice weevil; and tomato fruit worm. It is pointed out that the native persimmon is a host and reservoir for certain destructive insects, including the twig girdler, the persimmon psylla, and the flat and round-headed borers.

Entomology (*Utah Sta. Bul. 198 (1926), pp. 39–41*).—A brief reference is made to the several insect projects under way, particularly to tests of different baits for ants, by I. M. Hawley, and studies of the Chalcis fly in alfalfa seed, by C. J. Sorenson.

Insect pests (*Washington Col. Sta. Bul. 208 (1926), pp. 66, 67*).—Reporting upon cranberry investigations, D. J. Crowley refers to a number of insect pests of importance during the year, including the fruit worm, scale insects, weevils, and tussock moths. Volck's oil spray used for fireworm control at strengths of 2, 3, and 4 per cent was found to have some value as an ovicide, although it had little effect upon the fireworm larva.

[Report of entomology and apiculture department of Wyoming Station] (*Wyoming Sta. Rpt. 1926, pp. 174, 175*).—Brief reference is made to work under way with the alfalfa weevil, American foulbrood, selective breeding of bees, wintering bees, honey production in the higher mountains, and studies in the manipulation of bees.

Directory of field activities of the Bureau of Entomology (*U. S. Dept. Agr., Misc. Circ. 80 (1926), pp. II+35, pl. 1*).—This directory is arranged alphabetically, by States.

[Report of the] entomological branch (*Canada Min. Agr. Rpt., 1925, pp. 91–105*).—This is a general statement of the entomological work of the year.

Report of the entomologist, C. Smee (*Nyasaland Dept. Agr. Ann. Rpt. 1925, pp. 9, 10*).—This brief report deals with insect pests of tobacco, cotton, coffee, and maize. The pink boll worm was discovered in the Mwaya-Ipiana plain of Tanganyika Territory and in North Nyasa. It was decided to prohibit the growing of cotton in the North Nyasa district for the future, and to delimit a quarantine area comprising Mombera, West Nyasa, and Kasungu districts and Kota-Kota district lying north of the Bua River, in which cotton growing is prohibited.

Insects of western North America, E. O. Essig (*New York: Macmillan Co., 1926, pp. XI+1035, figs. 766*).—This manual and textbook of insects of western North America is an outgrowth of the author's Injurious and Beneficial Insects of California, the second edition of which was published in 1915 (E. S. R., 33, p. 652). In the preparation of this work the author has reviewed all the available literature dealing with western insects, references to which are appended as footnotes. The data are presented systematically by orders, families, and subfamilies, and keys are given for the separation of the classes, orders, suborders, and families. The work includes indexes to the authors consulted (pp. 911–919), to host plants (pp. 920–934), and to the subject matter (pp. 935–1035).

How insects live: An elementary entomology, W. H. Wellhouse (*New York: Macmillan Co., 1926, pp. XV+435, figs. 333*).—This is an introduction to a course in economic entomology. Following brief general considerations, the subject is dealt with in systematic order, a chapter being devoted to each order and typical insects used to represent the orders and the various groups in the larger orders. This is followed by a list of the orders and families of insects, a chapter on the phylum Arthropoda, and a chapter presenting suggestions for collecting insects and illustrated keys for distinguishing the principal orders and families of adult insects and some common larvae.

Physiological studies of the effect of arsenicals on the respiratory metabolism of insects, D. E. Fink (*Jour. Agr. Research [U. S.], 33 (1926), No. 11,*

pp. 993–1007, figs. 8).—The author reports studies made of the effect upon the respiratory metabolism of the Colorado potato bettle (adults) produced by feeding foliage sprayed with various arsenicals. Similar experiments were also made upon wireworms fed grains of corn soaked in arsenical solutions. It was found that the metabolic activity of the potato beetle was reduced when the beetle was fed on lead arsenate, calcium arsenate, ferric arsenate, and manganese arsenate from 2 to 16 hours and increased when fed on realgar for the same period. The percentage depression of the oxygen consumption and the carbon dioxide production was found to vary with the arsenical employed. The respiratory metabolism of the insects was reduced when they were fed the oxide components of arsenical compounds, including lead oxide, manganese oxide, ferric oxide, and calcium oxide. With the concentration of arsenious and arsenic-acid solutions used, it was found that arsenious acid was 57 per cent more toxic than arsenic acid. Similarly it was found that sodium arsenite was 59 per cent more toxic than sodium arsenate.

The discovery of the insecticidal property of carbon disulphide, P. Simmons and G. W. Ellington (*Science, 64 (1926), No. 1657, pp. 326, 327*).—It is pointed out that the insecticidal value of carbon disulfide was discovered by L. Garreau, who reported upon it in July, 1854.

Toxicity of sodium silicofluoride and arsenical mixtures to plant foliage, A. P. Kerr and C. E. Smith (*U. S. Dept. Agr., Off. Rec., 4 (1925), No. 48, p. 5*).—In experimental control work with blister beetles (*Epicauta lemniscata*) in May and June, 1925, the application of a dust containing calcium arsenate and sodium silicofluoride caused much greater injury to the plant than where these insecticides were used separately. This led to investigations from which it was concluded that chemical reactions occur where either calcium arsenate or Paris green is mixed with sodium silicofluoride in the presence of moisture, and that high percentages of water-soluble arsenic are released as a result of the reaction.

Undiluted sodium silicofluoride in two grades (C. P. and a commercial product containing 98 per cent) caused only slight burning, whereas mixtures made up of equal parts of calcium arsenate and sodium silicofluoride completely killed the soy beans. The experiments indicate that great caution should be used in combining sodium silicofluoride with certain arsenicals for insecticidal use on plants, especially those containing metallic elements which combine readily with the silicofluorides.

Contribution to the study of diseases of insects caused by filtrable virus.—A new group of ultramicroscopic parasites: The Borrellina [trans. title], A. Paillot (*Ann. Inst. Pasteur, 40 (1926), No. 4, pp. 314–352, figs. 9*).—This is a more extended account than that previously noted (E. S. R., 55, p. 458) of the author's investigations of ultramicroscopic parasites which cause diseases in insects, and for which the genus Borrellina was erected. The account includes a list of 51 references to the literature.

Soil treatment for subterranean insects, A. L. Melander, R. L. Webster, and A. Spuler (*Washington Col. Sta. Bul. 208 (1926), pp. 21, 22*).—Results obtained after the publication of Bulletin 199, previously noted (E. S. R., 55, p. 55), indicate that sodium fluosilicate is also an effective poison for use in the control of root weevils affecting strawberries.

Tests of insecticides for potato insects, C. G. Selvig (*Minnesota Sta., Crookston Substa. Rpt. 1925, pp. 51, 52*).—Brief reference is made to tests of two lots of potato green A and B supplied by a chemical company, which were found to be equal in effectiveness to lead arsenate when applied at the rate of 2 lbs. and 4 lbs., respectively, to 50 gal. of water. Three compounds

of London purple from a white lead company were found effective against the beetles, and caused no injury to the foliage.

Some of the more important insects attacking nut trees in Illinois, W. P. FLINT (*North. Nut Growers Assoc. Proc., 16 (1925), pp. 108–114*).—The insects here considered include the hickory tiger beetle or borer, flat-headed borer, hickory twig girdler, oak twig pruner, walnut caterpillar, nut weevils, and nut curculios. Control measures are given for each.

Handbook of citrus insect control for 1926, R. S. WOGLUM (*Calif. Fruit Growers Exch., Los Angeles, Bul. 3 (1926), pp. 17*).—This is an analysis of the value of sprays as compared to fumigation for scale insect control, based on results obtained by the author and J. R. LaFollette during the season of 1925–26. The red scale, black scale, citricola scale, purple scale, and red spider are dealt with. The effect of "oil film" sprays on lemons from the packing house standpoint is considered by H. W. Nixon (pp. 15, 16).

Distribution, life history, economic importance, natural enemies, and control of the common field cricket, Gryllus assimilis Fab., H. C. SEVERIN (*South Dakota Sta. Rpt. 1925, pp. 23, 24*).—An account of this pest has been noted (E. S. R., 55, p. 355). In control work in alfalfa fields with the granular form of calcium cyanide the author failed to obtain satisfactory results.

Notes on the biology of the leafhopper Eutettix strobi Fitch, F. A. FENTON (*Iowa Acad. Sci. Proc., 31 (1924), pp. 437–440, figs. 3*).—This is a brief account of a leafhopper which produces stigmonose on the leaves of the common pigweed or lamb's-quarters (*Chenopodium album*).

The chinch bug on St. Augustine grass lawns, J. R. WATSON (*Florida Sta. Press Bul. 371 (1925), pp. 2*).—Attention is called to the injury caused by chinch bugs to this popular lawn grass in Florida and means of control through the use of calcium cyanide and nicotine sulfate lime dusts.

Chinch bug control on St. Augustine grass, A. H. BEYER (*Citrus Indus., 7 (1926), No. 8, pp. 13, 16, 17*).—A practical account of this pest and means for its control in Florida.

A new species of Triphleps (Heteroptera, Anthocoridae) preying on the eggs of Heliothis obsoleta H. S. in Queensland, W. E. CHINA (*Bul. Ent. Research, 16 (1926), No. 4, pp. 361, 362, fig. 1*).—Under the name *T. australis* the author describes a new species which attacks the eggs of the boll worm in Queensland.

Plum aphis and brown rot control, A. H. LEES and H. R. BRITON-JONES (*Jour. Pomol. and Hort. Sci., 4 (1925), No. 3–4, pp. 196–199*).—This has been noted from another source (E. S. R., 55, p. 662).

The aphids of Myzocallis infesting the bamboo, R. TAKAHASHI (*Ent. Soc. Wash. Proc., 28 (1926), No. 7, pp. 159–162, figs. 8*).—Seven species of Myzocallis are recorded as known to infest the bamboo. *M. taiwanus*, which attacks the young leaf and shoot at Taihoku and Karenko, Taiwan, is described as new.

Factors influencing citrus aphis outbreak, J. R. WATSON (*Citrus Indus., 7 (1926), No. 9, pp. 10, 11, 33*).—A discussion of the factors influencing the occurrence of *Aphis spiraecola* in Florida. It is pointed out that the aphid has recently been reported as seriously damaging citrus trees in Louisiana, and that specimens have been received from the Satsuma belt of Alabama. In Florida, Satsumas from Gainesville south are as severely infested as any other variety of citrus, but there are no signs of its presence on Satsumas in most of the Satsuma belt in the State.

Lepidosaphes destefanii Leon, a new enemy of the olive [trans. title], P. HERCE (*Bol. Estac. Patol. Veg.* [*Inst. Agr. Alfonso XII, Madrid*], *1 (1926), No. 2, pp. 53, 54, figs. 3*).—The author records the infestation of the olive at Maella, Saragossa, Spain, by this scale.

Studies on the potato tuber moth during the winter of 1925–1926, G. W. UNDERHILL (*Virginia Sta. Bul. 251 (1926), pp. 21, figs. 6*).—This is an account of studies of the potato tuber worm in fields on the eastern shore of Virginia. It includes a discussion of the percentage that failed to survive the winter in the fields in which a fall crop of potatoes had been grown, with the death rate of prepupae and pupae; number of insects that failed to survive the winter when attached to cornstalks in fields in which a spring crop of potatoes had been produced; observations of the death rate of pupae in the soil; location of pupal cocoons in the field; observations of the different stages of the potato tuber worm during the winter; comparison of the temperature of the past winter with other years; and parasites and predators.

It was found that during the winter of 1925–26 only the pupal stage survived out of doors, while in the storage houses, where the temperatures remained above freezing, all stages remained alive throughout the winter. The infestation of the spring crop fields was traceable to culls and volunteers. The great reduction in number of insects during the winter seemed to be largely due to low temperatures, the work of parasites, and the habit of the moths of emerging during the winter. The fact that only about 5 per cent of the pupae survive until March is due to the combined effect of cold and the work of parasites. Six species of parasites were observed which, in order of importance, are: *Campoplex ferrugineipes* Ashm., *C. phthorimaeae* Cush., *Ephiates aequalis* Prov., *Bracon gibbosus* Say, *Apanteles carpatus* Say, and *Itoplectis conquisitor* Say. Two predators, namely, *Podisus spinosus* and *Lyctocoris campestris* Fabr., were observed to attack and kill the larvae. With 1,872 cocoons from above ground examined, parasitism ranged from 3 to nearly 50 per cent, with an average of nearly 30 per cent.

The European corn borer in Ohio, L. L. HUBER and C. R. NEISWANDER (*Ohio Sta. Bimo. Bul., 12 (1927), No. 1, pp. 2–13, figs. 7*).—This is a practical account arranged in the form of 53 questions and answers. The article concludes with a discussion of the corn borer control program.

Learning to live with the European corn borer, W. P. FLINT, J. C. HACKLEMAN, and F. C. BAUER (*Illinois Sta. Circ. 313 (1927), pp. 16, figs. 11*).—In this circular the author gives the latest information concerning the spread of the corn borer and methods for combating it.

Codling-moth in apricots, F. W. PETTEY and C. J. JOUBERT (*Union So. Africa Dept. Agr. Jour., 12 (1926), No. 5, pp. 461–483*).—This is a further report of studies of the life history and control of the codling moth at Wellington during the 1925–26 fruit season (E. S. R., 54, p. 156).

The insect continues to be a serious pest of apricots in many Wellington orchards, where practically no pear, apple, or quince orchards exist, and it appears to be slowly spreading to most orchards in the district. It has now been reared from loquats. The infestation was less than in the previous year, but it averaged from 10 to 15 per cent in orchards where no efforts were made to control the pest. It was found that 31 per cent of the infestations in Alphas and from 48 to 67 per cent of those in Royals did not become serious except for the exporter of fresh fruits, owing to the fact that either the larvae left these fruits soon after they burrowed through the skin, or died prematurely. One codling moth larva may infest or injure several apricots before it finally establishes itself in a fruit to develop to maturity. Spraying can not yet be recommended for the control of this pest in appricot orchards, and it is confidently expected that it will be unnecessary if the other measures of control, particularly banding, are thoroughly and properly practiced.

The sugar cane moth stalkborer (Diatraea saccharalis saccharalis Fab.), D. L. VAN DINE (*Trop. Plant Research Found. [Wash., D. C.] Bul. 2 (1926), pp. 11*).—A brief account of this pest in Cuba, its Cuban parasites, viz, *Trichogramma minutum* Riley, *Euzenilliopsis diatraea* Twns., *Sarcophaga sternodontis* Twns., *Apanteles diatraeae* Mues., *Bassus stigmaterus* Cress., and *Isaria (Cordyceps) barberi* Giard, and means of control.

Spraying tests in controlling sugar beet webworm, C. G. SELVIG (*Minnesota Sta., Crookston Substa. Rpt. 1925, pp. 56, 57*).—The results obtained on August 15 with 8 different spraying treatments are reported in tabular form. Liquid sprays were found much more effective than dust sprays of the same poison due to their better sticking qualities.

On Psara phocopteralis as a pest on grasses in south India, M. C. CHERIAN and C. J. GEORGE (*Jour. Bombay Nat. Hist. Soc., 31 (1926), No. 2, pp. 529, 530, pl. 1*).—A brief account is given of the life history of this enemy of fodder grasses in Malabar. It is known to occur on *Panicum javanicum*, *P. miliaceum*, *Andropogon annulatus*, and *Cynodon dactylon*, and probably feeds on any common grass, having in one instance been reared from wheat. It has also been found in Coimbatore, Bangalore, and Bellary. A single specimen of the ichneumon parasite *Syzeuctus annulipes* was reared from a larva.

A revision of the adult anopheline mosquitoes of Japan, II, S. YAMADA (*Tokyo Imp. Univ., Govt. Inst. Infect. Diseases Sci. Rpts., 4 (1925), pp. 447–493*).—This completes the paper previously noted (E. S. R., 55, p. 459), 14 forms having been recognized.

The mosquitoes of the Lower Fraser Valley, British Columbia, and their control, E. HEARLE (*Canada Natl. Research Council Rpt. 17 (1926), pp. 94, pl. 1, figs. 42*).—A discussion of the Lower Fraser Valley mosquito problem, with keys to Lower Fraser Valley mosquitoes, descriptions and accounts of species in habitat groups, a list of Lower Fraser Valley mosquitoes, and control measures.

House flies and their connection with manuring operations on estates in Ceylon, F. P. JEPSON (*Ceylon Dept. Agr. Bul. 74 (1926), pp. 16, pls. 7*).—The author records *Musca yerburyi*, *M. nebulo*, *Stomoxys calcitrans*, *Ophyra nigra*, and *Chrysomyia megacephala* as breeding in artificial manure. Of these *M. yerburyi* and *M. nebulo* are the only ones concerned in the swarms which invade bungalows, and the former is probably more commonly met with. The studies indicate that the swarms of flies which coincide with manurial operations on estates originate, in most cases, from eggs laid after the manure has been spread in the field, by flies which were already present on the estate in small numbers. Experiments conducted demonstrated that flies will neither oviposit nor breed in perfectly dry artificial manure, although they will readily do so when certain of these manures are moistened.

Some experiences in the control of fly-breeding, E. B. ALLNUTT (*Jour. Roy. Army Med. Corps, 47 (1926), No. 2, pp. 105–120, fig. 1*).—This deals with the method of treating stable litter in a two-stalled manure pit, practical points in working the method, experimental work in connection with fly breeding in manure, etc.

Biology of the red-tailed Tachina-fly, Wintbemia quadripustulata Fabr., H. W. ALLEN (*Mississippi Sta. Tech. Bul. 12 [1925], pp. 32, figs. 10*).—This is a report of investigations commenced in 1923 and continued through 1924 and part of 1925. It is shown that this parasite occurs over the greater part of Europe and a large part of North America and has been reared from no less than 48 lepidopterous hosts in Europe and North America, and that Coleoptera may be occasionally attacked. The author considers it to be without question one of the most valuable native insect parasites. Following the presentation of a list of hosts and their habits and a discussion of its economic importance,

technical descriptions are given of its several stages, then an account of bionomic studies, including duration of life stages, seasonal cycle, habits of the adult, food, habitat, oviposition, emergence from the egg, and habits of the larva. The author has found that in Mississippi this species hibernates as a full grown maggot in the soil, though it has been reported in Europe to pass the winter in the pupal stage. Three additional complete broods and a partial fourth are described. *A bibliography of 48 titles is included.*

Weevil biological work (*South Carolina Sta. Rpt. 1926, pp. 7–10, fig. 1*).—This is a brief reference to studies of the life history and habits of the boll weevil near Florence, conducted cooperatively by F. A. Fenton and E. W. Dunnam, of the U. S. D. A. Bureau of Entomology. In hibernation work with 12,425 weevils placed in cages, 54 per cent of the 102 survivors had emerged by April 28, and 99 per cent by June 7, when the first squares were developed. Cages located in the woods gave an average survival of 0.42 per cent as compared with 1.20 per cent for those placed in the open. There was a survival of 0.1 per cent from the cage stocked September 18, while no weevils issued from those stocked September 24 and October 1. It was found that 100 per cent of the weevils emerging from April 27 to May 28, and placed in cages over cotton in the field, were dead by June 7, when the cotton began to fruit. There were 4 generations of weevils during the year. The first-generation weevils emerged from July 5 to August 27, and the second from July 25 to September 24, the peak of weevil emergence being reached about August 2. The first migrating weevil was collected on July 7, with the greatest migration taking place between August 28 and September 14. Of the 6 parasites of the boll weevil reared in the vicinity of Florence, *Microbracon mellitor* was by far the most important.

Senses of the cotton boll weevil—an attempt to explain how plants attract insects by smell, N. E. McIndoo (*Jour. Agr. Research* [*U. S.*], *33* (*1926*), *No. 12, pp. 1095–1141, figs. 16*).—In this account the author deals with chemotropic experiments (pp. 1097–1102) and morphology of the sense organs of the adult stage (pp. 1102–1126) and of the larval stage (pp. 1126–1135) of the boll weevil, with illustrative drawings. The account concludes with a discussion of the manner in which plants attract insects by smell and a summary of the senses. A list of 60 titles of literature cited is included.

Boll weevil control tests (*Georgia Coastal Plain Sta. Bul. 6* (*1926*), *pp. 21, 22*).—In a brief reference to control work conducted it is pointed out that the work has shown conclusively the benefits of early poisoning. Applications may be made with calcium arsenate dust or with the homemade mixture of molasses, calcium arsenate, and water, the latter being probably more practical since it does not require the use of dusting machinery. The applications should be begun a week to ten days before squaring, and two to three applications be made at weekly intervals.

Bee diseases in United States, A. P. Sturtevant (*Gleanings Bee Cult., 54* (*1926*), *No. 10, pp. 648–653, figs. 5*).—This is a report upon a study of records of samples received by the U. S. D. A. Bureau of Entomology bee culture laboratory during a period of 20 years.

The Brazilian beekeeper, E. Schenk (*Der Brasilianische Bienenzüchter. Porto Alegre: Germano Gundlach & Co., 1925, 6. ed., pp. 250, pls.* [*40*], *figs.* [*155*]).—This is a textbook on beekeeping in Brazil.

New chemical for beekeepers, C. L. Corkins (*Gleanings Bee Cult., 54* (*1926*), *No. 10, pp. 644–646*).—It is pointed out that calcium cyanide is a new and most useful chemical for the beekeeper, being efficient in the destruction of diseased honey bees, wild bees, the wax moth, and ants without poisoning the honey.

The control of big bud mite in the field, R. G. Hatton, J. Amos, and H. M. Tydeman (*Jour. Pomol. and Hort. Sci., 5* (*1926*), *No. 2, pp. 124–130, pl. 1*).—

currant bushes be sprayed with winter-strength lime sulfur (1.025 sp. gr.) just as the bloom trusses are appearing and before they open.

ANIMAL PRODUCTION

Some relations between fertility and the composition of the diet, A. G. HOGAN and H. M. HARSHAW (*Missouri Sta. Research Bul. 94 (1926), pp. 23, figs. 8*).—This is a further study along lines previously noted (E. S. R., 55, p. 90). Synthetic diets containing casein, starch, lard, cod-liver oil, yeast, cellulose, various salt mixtures, vitamin B, wheat germ and wheat-germ oil were used to determine whether there is a specific vitamin controlling reproduction.

When rations containing no known source of vitamin E were fed to rats sterility resulted. Females became pregnant, but in many cases the litters were resorbed and when young were produced they were either born dead or died in a short time. Sterility did not occur immediately, and females in some cases produced litters 7 months after being placed on the experimental diet. Using wheat germ or wheat-germ oil resulted in the birth of a normal number of litters. Observations did not indicate that sterility was due to anemia. When males were fed rations containing no vitamin E the testes showed lack of sperm and a typical condition of atrophy.

Commercial feeding stuffs, H. R. KRAYBILL ET AL. (*Indiana Sta. Bul. 303 (1926), pp. 20, fig. 1*).—A report of samples collected for official inspection during 1925, a list of the feed manufacturers, and the number of samples of their products examined, passed, not passed, and not tagged (E. S. R., 54, p. 357).

Inspection of commercial feedstuffs, P. H. SMITH, F. J. KOKOSKI, ET AL. (*Massachusetts Sta. Control Ser. Bul. 36 (1926), pp. 29*).—This publication consists of tables giving the results of chemical and microscopic analysis of 1,428 feeding-stuff samples collected for official inspection during the year ended September 1, 1926 (E. S. R., 54, p. 663).

Izze, the most expensive steer in North Dakota, J. H. SHEPPERD (*North Dakota Sta. Circ. 34 (1926), pp. 4, fig. 1*).—This circular indicates in a popular manner the difference between purebred and scrub cattle.

[Cattle feeding experiments at the Crookston Substation], C. G. SELVIG (*Minnesota Sta., Crookston Substa. Rpt. 1925, pp. 62–64*).—The results of two experiments on fattening cattle are briefly reported.

Pasture trials for cattle.—In continuing the pasture trials with yellow blossom sweet clover and brome grass (E. S. R., 55, p. 359), the cattle made average gains per head for the 112-day period of 98 and 105 lbs., respectively. After September 1 the cattle on the brome grass just maintained weight, while those on sweet clover were turned into a new growth and made an average daily gain during 28 days of 1.43 lbs.

Fattening two-year-old steers.—Four lots of six 2-year-old steers each were selected for comparing the value of ground wheat screenings when used as a portion of the grain ration with whole or ground barley and oil meal. As fed in the different lots the grain rations consisted of 45 per cent wheat screenings, 45 per cent ground barley, and 10 per cent oil meal; 90 per cent whole barley and 10 per cent oil meal; 90 per cent ground barley and 10 per cent oil meal; and 90 per cent ground barley and 10 per cent oil meal, the last being fed sweet clover hay and corn silage and the other lots alfalfa hay and corn silage as roughage. The lot receiving the wheat screenings made average daily gains of 3.13 lbs., while on whole barley there were produced average daily gains of only 2.13 lbs. and on ground barley with alfalfa hay 3.08 lbs. The average daily gain with ground barley and sweet clover hay was 2.86 lbs. The results showed that wheat screenings proved to be slightly more efficient when replacing half the barley than barley alone. Ground barley increased the rate of

gain and the resulting profit, and improved condition of the experimental animals as compared with whole barley. Sweet clover was inferior to alfalfa.

[Experiments in beef production at the South Carolina Station] (*South Carolina Sta. Rpt. 1926, pp. 57–59, figs. 3*).—Experimental work with beef cattle was continued as previously noted (E. S. R., 54, p. 664).

Steer feeding.—Twenty-four grade steers under 2 years of age, averaging 675 lbs., were divided into 3 lots. One lot receiving cottonseed meal and hulls made an average daily gain per head of 1.75 lbs. in a 112-day feeding period. A similar lot fed cottonseed meal and corn silage gained at the rate of 2.13 lbs. The third lot, receiving soy bean oil meal and corn silage, made 2.07 lbs. daily gain. The cost of 100 lbs. gain was $15.84 in lot 1, $12.39 in lot 2, and $13.95 in lot 3.

Wintering feed cattle at the Coast Station.—A purebred Aberdeen Angus herd was fed from December 22 to March 30 on cottonseed meal, sorghum silage, and either hay or straw as additional roughage. The mature cows gained 112 lbs. per head at a cost of $17.87, while the heifers gained 78 lbs., costing $13.01 per head.

Roughage rations for two year old steers, H. HACKEDORN, J. SOTOLA, and R. P. BEAN (*Washington Col. Sta. Bul. 208 (1926), pp. 12, 13*).—Four groups of 10 steers each weighing from 850 to 900 lbs. per head were selected for comparing home-grown roughages. One lot receiving whole alfalfa hay made average daily gains of 1.22 lbs. per head, while lots receiving alfalfa hay and silage in equal parts, alfalfa hay and silage 1 : 2, and the waste alfalfa hay from the first lot made average daily gains of 1.52, 1.78, and 0.69 lbs. per head, respectively. The results of this 90-day experiment indicated that the feeding of corn silage with alfalfa hay was a much better practice than feeding alfalfa hay alone.

Fattening calves in Arizona, E. B. STANLEY and E. L. SCOTT (*Arizona Sta. Bul. 116 (1926), pp. 314–336, figs. 7*).—The experimental work reported in this bulletin is the first of a series of trials to determine the economical possibilities of fattening calves in Arizona. Sixty high-grade Hereford calves, averaging about 375 pounds in weight, were divided into 6 lots of 10 head each. Lots 1, 4, 5, and 6 were steer calves. Lot 3 was composed of heifer calves, and lot 2 was divided into 4 head of heifers and 6 head of steers. Lots 1, 2, 3, and 4 were fed corn silage, alfalfa hay, rolled barley, and cottonseed meal. In the first 3 lots the silage was fed in the proportion of 1 part hay to 2 parts silage. In lot 4 all the silage the calves would consume was fed. Lot 5 received the same ration except that no cottonseed meal was fed during the first 90 days. Lot 6 received alfalfa hay, rolled barley, and cottonseed meal.

The results indicate that heifer calves finished as well when fed in the pen with steers as when fed in separate lots. Heifer calves gained slower and required more feed per unit of gain than steer calves, but attained a market finish earlier. Limiting the silage received in proportion to the hay consumed gave somewhat higher gains, decreased the cost of gains, and the margin necessary to break even. Steers in the silage-fed group made more efficient use of their feed and more economical gains than those receiving no silage. Adding cottonseed meal to a ration of corn silage, alfalfa hay, and rolled barley did not effect an economical saving of rolled barley. The 10 smallest calves in the experiment made a daily gain of 2.13 lbs. as compared with 1.9 lbs. with the 10 largest calves.

Calves fed on the feeds grown in Salt River Valley attained a satisfactory finish, but were not good enough to bring the premium paid for baby beef, either because they were not large enough to begin with or the feeding period was too short.

Sheep breeding and feeding trial, C. G. SELVIG (*Minnesota Sta., Crookston Substa. Rpt. 1925, pp. 64–69, fig. 1*).—In a study of the possibilities of economic sheep production in the Red River Valley region of Minnesota, four lots of 40

ewes were selected and wintered on various combinations of feed. One lot receiving alfalfa hay and ground barley produced 38 living lambs and lost an average of 1.19 lbs. per head from November 18 to May 26. Another receiving the alfalfa hay and ground wheat screenings produced 43 lambs and lost an average of 5.95 lbs. per head. The other two lots, receiving sweet clover hay and ground barley and sweet clover hay and ground screenings, produced 42 and 34 lambs, respectively, and the former gained 2.29 lbs. per head in live weight, while the latter lost 2.68 lbs. In the spring one-half of the lambs were turned on sweet clover pasture and the other half on native pasture. Beginning with August 26 they were fed in the sheep barn on a light grain ration of ground barley and ground oats with alfalfa hay, which was somewhat modified as the fattening period progressed. When sold on the Chicago market in November they brought practically top prices. Though the calculated profits for the enterprise were small, it is nevertheless concluded that this experiment shows that there is no reason why sheep production can not be carried on profitably on a Red River Valley farm.

Sheep breeding to eliminate the tail, J. W. Wilson (*South Dakota Sta. Rpt. 1925, p. 9, fig. 1*).—By crossing fat-rumped sheep with other breeds and selecting tailless nonfat-rumped offspring having desirable characteristics for several generations, 18 out of 21 lambs produced during the first year were short-tailed and the majority had good fleeces, while only a few showed any evidence of the fat rump.

[Experiments in sheep production at the South Carolina Station] (*South Carolina Sta. Rpt. 1926, pp. 59–61, fig. 1*).—A brief description of the work.

Sheep improvement by use of purebred rams.—Sixty native ewes from the coastal section were bred to a purebred Southdown ram. The first cross lambs sheared fleeces averaging 5.08 lbs., while the fleeces of the ewes averaged 4.15 lbs. The lambs showed marked improvement in mutton qualities over their dams. The ewes responded to good feed and care. In September, 1923, they averaged 65 lbs. in weight and in 2 years had increased to 80 lbs. The fleeces in 1923 averaged 1.8 lbs. and two years later weighed 4.15 lbs.

Cottonseed meal and hulls v. mixed soybean and grass hay for wintering ewes.—Forty ewes were divided into 2 lots and fed for 70 days. One lot received cottonseed meal and hulls and the other mixed soy bean and grass hay. After 28 days the ewes on hay had failed to gain so cottonseed meal was added to the ration. The ewes on cottonseed meal and hulls gained 18 lbs. per head at a cost of $1.54, and those on hay gained 13 lbs. at a cost of $2.09. A record of the weight of the lambs at birth showed that those from the cottonseed meal and hull ewes weighed 7.77 lbs. and those from ewes fed hay averaged 7.95 lbs.

The searing iron v. the knife for docking lambs.—Twenty grade lambs, 1 to 2 weeks old and docked with a sharp knife, gained faster and the wounds healed more rapidly than a similar lot docked with the searing iron.

The nutritive value of first, second, and third cuttings of alfalfa hay, J. Sotola (*Washington Col. Sta. Bul. 208 (1926), pp. 13, 14*).—In 54 separate digestion and metabolism studies with ewe and wether lambs, it was found that sheep fed alfalfa hay excreted 44.79 per cent of the ingested organic matter in the feces. Two and one-third lbs. of water were consumed per pound of feed when receiving dry feed such as alfalfa hay, with some variation resulting from the environmental temperature. The largest yields of digestible matter per acre were obtained when the first and second cuttings were made in the one-half or three-fourths stages of bloom. The second cutting yielded the most digestible matter per acre when cut at the three-fourth to full bloom stage, though no differences were apparent in the first cutting. The third

cutting was best made at the half bloom stage for obtaining the maximum yield of digestible matter per acre. When the first and second cuttings were made in the three-fourth bloom stage and the third in the half bloom stage a total of 192.71 lbs. of calcium and 20.36 lbs. of phosphorus were removed per acre during the season.

Sheep feeding.—XIV, Fattening western lambs, 1925–1926, C. Harper (*Indiana Sta. Bul. 304 (1926), pp. 12, fig. 1*).—In work done to check results of previous experiments, a comparison of hominy feed and shelled corn resulted in approximately the same gain and feed consumption. The corn-fed lambs made somewhat cheaper gains (E. S. R., 43, p. 375).

Lambs fed clover hay in comparison with soy-bean hay (E. S. R., 54, p. 363) gained 5.8 lbs. more per lamb in 60 days and cost $2.12 less per 100 lbs. of gain.

When the amount of legume hay fed was varied (E. S. R., 41, p. 70), it was found that lambs fed hay each day gained faster but at no less cost than those fed hay every fifth day. The market finish was the same in both cases.

Lamb feeding experiments in the sugar beet growing districts, J. A. Holden (*Nebraska Sta. Bul. 216 (1926), pp. 21, fig. 1*).—The data presented in this bulletin represent a continuation of a study of lamb feeding on irrigated farms in western Nebraska (E. S. R., 49, p. 670). The work reported was begun in the fall of 1922 and continued for three successive winters. The first winter there were 30 lambs per lot, averaging 48 lbs. initial weight, and the second and third winters 25 lambs per lot, averaging 45 and 59 lbs.

The objects of the experiment were to compare: (1) Corn, barley, and dry pulp when fed with alfalfa hay; (2) cottonseed cake and linseed cake when fed with either corn, barley, or dry pulp; and (3) corn silage, beet-top silage, beet tops, and cull potatoes when fed with a ration of corn, cottonseed cake, and alfalfa hay. The lambs in each lot were fed all the alfalfa hay they would eat without waste. When on full feed the lambs were fed corn, barley, and dry pulp at the rate of 1 lb. per lamb daily, cake at the rate of ⅓ lb., and silage or potatoes at the rate of 1.6 lbs. Beet tops were fed in amounts that the lambs would clean up.

The following table gives the summary of the combined 3 years' work:

Summary of three years' comparative feeding tests in fattening lambs in western Nebraska

Lot	Average gain per lamb	Feed required per 100 pounds gain										Selling price per 100 pounds
		Corn	Barley	Dry pulp	Cottonseed cake	Linseed cake	Alfalfa hay	Corn silage	Beet-top silage	Beet tops	Cull potatoes	
		Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	
1	30.3	335					683					$15.40
2	27.0		375				770					15.30
3	24.0			422			851					15.25
4	35.4	286			92		552					15.65
5	32.4		312		100		660					15.55
6	33.7			301	96		632					15.50
7	35.2	288				92	590					15.55
8	32.2		315			101	671					15.55
9	33.1			306		98	638					15.50
10	36.0	282			90		455	478				15.70
11	37.2	272			87		476		462			15.65
12	37.4	270			87		455			[1] 1.62		15.60
13	38.4	263			84		486				447	15.65

[1] Per ton of yield.

Effect of feeding and management of sheep on the tensile strength and elasticity of wool, W. E. Joseph (*Jour. Agr. Research [U. S.], 33 (1926),*

No. 11, pp. 1073–1089, figs. 7).—Wool fibers taken from the shoulders of Rambouillet ewes in several flocks wintered under range and semirange conditions were compared as to stretch by each increment of weight or stress, the elastic limit point, total stretch at the breaking point, breaking stress, and diameter, with the fibers of yearling wethers and ewes and mature ewes which were wintered under good farm conditions. The methods of testing the fibers were essentially described in earlier work at the Montana Experiment Station (E. S. R., 33, p. 762).

The average results of these tests indicated lower values for the range ewes for stretch, break, and diameter, but higher values for range ewes for average elongation, tensile strength, elastic limit on equal area, and Young's modulus, which is the relation between the product of length and stress divided by the product of stretch and area of the cross-section.

The data are presented in tables and graphs. These show a rather uniform tendency of a smaller diameter of fiber from the aged ewes as well as the yearling wethers and yearling ewes kept under range or semirange conditions, as compared with those kept under more favorable conditions. A greater strength of the small fibers per unit of area of cross-section was explained on the basis of the medulla making up a greater proportion of the cross-section than the cortex in case of the fibers having the greater diameter.

In a second experiment lots of wethers were fed for 5 to 6 months during the winter on rations of alfalfa hay, oats, and linseed oil meal, as compared with mixed hay in 1 year, and alfalfa as compared with oat straw and cottonseed cake in 2 other years for a study of the effect of such feeling on the quality of the wool of individual animals.

An analysis of these results showed no variation in the stretch, break, diameter, average elongation, tensile strength, Young's modulus, or elastic limit on equal area which could be ascribed to differences in the feed during the test period, notwithstanding the fact that the fleeces of the wethers in the lots fed straw and cottonseed cake were dry, harsh, and lifeless to the touch as compared with fleeces of the wethers fed a liberal ration of alfalfa hay, which were in every case quite satisfactory in condition.

The fleeces grown during the period in part of which hay was fed were uniformly heavier than those produced during the year represented by the test period on straw and cottonseed cake. With two exceptions the length of the staple showed a uniform tendency to decrease with the advancing age of the wethers for the first two fleeces, but in the third fleece there was no tendency for a decrease in the length of staple as compared with the second fleece. Age appears to be a greater factor in determining the length of staple than the rather marked differences in the level of feeding over a period of 5 to 6 months. Opposed tendencies on the length of staple and the weight of the fleece observed, as well as the lack of change in the diameter of the fiber or apparently in the quantitative relations of such structural parts of the fiber as influence its strength or elasticity, indicated that while the physical properties of the wool fiber itself are not easily changed either quantitatively or qualitatively, the yolk or grease and other factors that go to make up shrinkage are easily subject to influence by the level of feeding.

It is concluded from these experiments that the level of winter feeding should be determined according to the needs for other purposes than for wool production, because any additional weight of fleece produced by more liberal winter feeding of sheep in good physiological condition is concerned largely with the factors making up shrinkage and only slightly with the actual wool fibers.

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Pork production at the North Platte Substation, W. P. SNYDER (*Nebraska Sta. Bul. 214* (*1926*), *pp. 27, fig. 1*).—The results of several years' work with hogs at the North Platte Substation are summarized.

Comparison of the relative feeding values of white and yellow corn for fattening hogs.—The results of 3 winter and 1 summer test, involving 210 fattening pigs, are summarized. Nine lots of pigs fed white corn and various other feeds made an average daily gain of 1.35 lbs., as compared with 1.36 lbs. for similar lots fed yellow corn and other feeds. The feed required for 100 lbs. of gain for those fed white corn was 358 lbs., and for those fed yellow corn 377 lbs. When pigs had access to both white and yellow corn there was no appreciable difference in the rate of gain, economy of feed required to produce a unit of gain, or the amount of either kind of corn eaten. The feeding or not feeding of alfalfa and other supplements did not favor corn of either color.

Sudan grass pasture v. alfalfa pasture.—In 3 years' work, the first year the grazing period was 60 days, while the last two years the tests were continued until the pigs had reached a marketable weight.

The first year the 15 pigs on alfalfa pasture made an average daily gain of 1.51 lbs., as compared to 1.3 lbs. for those on Sudan grass. The feed required for 100 lbs. of gain was alfalfa 359 lbs. and Sudan grass 402 lbs.

The second year 3 lots of 20 hogs each were pastured on alfalfa and 3 lots on Sudan grass. One lot on each type of pasture received a 1 per cent corn ration, another a 2 per cent corn ration, and the third was self-fed corn. On Sudan grass the light-grain-ration group gained at the rate of 0.19 lb. per day and required 517 lbs. of corn for 100 lbs. of gain. The 2 per cent grain group gained 0.48 lb. and required 419 lbs. of corn, and the self-fed lot gained 1.11 lbs. and required 406 lbs. of corn. The pigs on alfalfa fed the same rations gained at the rate of 0.47, 0.91, and 1.29 lbs., respectively, and consumed 214, 222, and 368 lbs. of corn per 100 lbs. of gain. All lots were put into dry-lot on October 21 and self-fed corn and tankage. The two lots self-fed in summer were ready for market in 2 weeks. The medium-fed lot on alfalfa pasture required 35 days to attain market weight, and the similar lot on Sudan grass required 65 days. The light-fed alfalfa lot reached market weight in 65 days and the light-fed Sudan grass lot was 14 days behind the similar alfalfa pigs and 28.5 lbs. under market weight.

The third summer one lot of 15 pigs on each kind of pasture was self-fed corn and tankage, another lot was self-fed corn, and one lot received a 2 per cent corn ration. The self-fed corn and tankage lot went to market direct from pasture. Those self-fed corn on alfalfa went 2 weeks later, and the 2 per cent corn on alfalfa and self-fed corn on Sudan grass lots followed in 7 weeks. The 2 per cent corn on Sudan grass lot was not ready for 10 weeks after the first group. From these results it is very doubtful if light summer feeding is particularly economical in either rate or cheapness of gains.

Tankage.—The results of several trials showed that the addition of tankage to corn increased the rate of gain, decreased the feed required per unit of gain, and usually increased the net profit. The addition of shorts to a corn and tankage ration had little or no effect upon the rate of gain. Feeding alfalfa hay in addition to corn and tankage did not increase the rate of gain, but decreased the corn and tankage required per 100 lbs. of gain. Feeding tankage on Sudan grass pasture increased the rate of gain.

Self-feeding v. hand-feeding and self-watering v. hand-watering.—Self-feeding and self-watering gave much greater gains at a considerable saving of feed required per unit of gain than hand-feeding or hand-watering. Hand-feeding decreased the rate of gain 0.2 lb. per pig daily, the amount of tankage eaten slightly, the cost of 100 lbs. of gain by 18 cts., and the profit per pig by 31 cts.

Finishing fall pigs, 1924.—When fall pigs were kept through the winter and put on feed when they reached about 150 lbs. in weight, it was found that the 20 pigs confined to a dry lot gave more rapid gain, cheaper gain, and returned more profit than the 25 pigs receiving a similar ration but run on alfalfa pasture. The pigs on dry lot consumed nearly twice as much tankage as those on pasture. One pound of tankage was found to be equal to 3.75 lbs. of shorts when fed as a supplement to corn to 25 157-lb. pigs on alfalfa pasture.

[Feeding experiments with swine at the South Carolina Station] (*South Carolina Sta. Rpt. 1926, pp. 52–54, fig. 1*).—A brief description of feeding work in continuance of experiments previously noted (E. S. R., 54, p. 665).

Comparison of green forage crops for hogs.—Fifty pigs averaging 40 lbs. in weight were divided into 5 lots. Lot 1 was full fed corn and tankage in dry lot; lot 2 a 2.5 per cent corn ration on green soy bean forage; lot 3 a 2.5 per cent corn and tankage ration on green soy bean forage; lot 4 a 2.5 per cent corn and tankage ration on Sudan grass; and lot 5 a 2.5 per cent corn and tankage ration on cowpea and sorghum forage. The average daily gains per pig were 0.54, 0.69, 0.77, 0.41, and 0.5 lb., respectively. Dry weather affected the growth of forage, especially the Sudan grass.

Hogging down peanuts, sweet potatoes, and corn at the Pee Dee Station.—Two series of tests were conducted; the second series was with later crops after the hogs had consumed the forage in the first series. Forty pigs averaging 118 lbs. were used in these tests. In the first series lot 1 was fed corn and tankage in dry lot. Lot 2 hogged down peanuts alone, lot 3 hogged down peanuts plus a 2 per cent corn ration, and lot 4 hogged down peanuts plus a 2 per cent corn and tankage ration. The average daily gains in this test were 1.66, 1.07, 1.58, and 1.79 lbs. per pig, respectively. The costs of gains were greatest for the dry lot pigs and cheapest in lot 3.

In the second series one lot of pigs on corn and tankage in dry lot made 1.88 lbs. average daily gain per pig. Lot 2 hogging down sweet potatoes plus tankage made 1.02 lbs. gain and lot 3 hogging down standing corn plus tankage made 1.64 lbs. The cost of gain was cheapest in lot 3 and most expensive in lot 1.

[Feeding pigs on pasture in South Dakota], J. W. Wilson (*South Dakota Sta. Rpt. 1925, p. 10*).—The results of two experiments are briefly reported.

Summer feeding of market pigs.—The results of two experiments in comparing corn, barley, and oats supplemented with tankage for feeder pigs on alfalfa pasture have indicated that when limited grain rations were fed 115 and 118 lbs., respectively, of barley and 143 and 146 lbs., respectively, of whole oats produced the same gains as 100 lbs. of yellow corn. During the finishing period in dry lot on yellow corn and tankage which followed the grazing, the type of ration fed with the pasture greatly influenced the subsequent gains. Estimates of the amount of feed saved by alfalfa pasture showed that in addition to yielding approximately 1.5 tons of hay during the season, 1 acre of such pasture saved over 25 bu. of corn and 579 lbs. of tankage.

A limited corn and tankage ration fed in dry lot did not produce satisfactory returns, as the gains were slow and losses were greater than in lots fed on alfalfa pasture.

Tankage requirements of pigs fed barley on pasture.—Tests showed that 100 lbs. of gain were secured for each 378 lbs. of ground barley and 11 lbs. of tankage fed to pigs with an initial weight of 42 lbs. and carried to a final weight of 200 lbs. These results indicated that barley is a very good substitute for corn, especially when the saving in tankage in this ration is compared with the amount needed in a corn and tankage ration.

Tankage for spring pigs on legume pasture, C. M. Vestal (*Indiana Sta. Bul. 300 (1926), pp. 14, figs. 2*).—Twelve trials begun in 1920 and carried on each year for six years have been completed, six with fattening pigs and six with growing pigs. March and April pigs, averaging 74, 62, 68, 76, 74, and 63 lbs. at the beginning of the several tests, were used in lots of 20. Clover pasture was used for 4 seasons and alfalfa pasture the other 2, together with yellow corn, 60 per cent protein tankage, and salt. The pastures were half-acre units. In case of shortage of pasture the pigs were removed to another unit until the original had made sufficient recovery to turn the pigs back on. In the fall when the pasture was gone the feeding was continued in dry lot until the pigs had reached the required market weight of 217 lbs.

In trials for fattening, the corn or corn and tankage was self-fed on legume pasture. In the trials for growth, the corn was limited to 2 lbs. daily for each 100 lbs. live weight. When corn and tankage were fed they were mixed 95 parts corn and 5 parts tankage by weight and fed at the rate of 2 lbs. for each 100 lbs. live weight. In these latter trials the pigs were kept on the growing ration until the close of the pasture season in September, when both groups were finished in dry lot on corn and tankage self-fed.

The following table gives the average returns for the 6 years' work:

Rate of gain and feed requirements of spring pigs

Kind of trial	Average daily gain per head		Feed required per 100 pounds gain				Extra time required by pigs without tankage
	With tankage	Without tankage	With tankage		Without tankage		
			Shelled corn	Tankage	Shelled corn	Tankage	
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Days*
Fattening	1.72	1.38	320.6	24.2	375.5	--------	22
Growing	0.72	0.67	263.8	14.5	292.0	--------	--------
Finishing	2.39	2.38	380.6	16.4	357.5	18.8	--------
Average of growing and finishing	1.20	1.18	331.2	15.6	332.0	11.5	--------

Fattening hogs on squashes and pumpkins, R. T. Smith and J. Sotola (*Washington Col. Sta. Bul. 208 (1926), p. 13*).—In tests of the feeding value of squashes and pumpkins for hogs, one group of 10 head, averaging 120 lbs. in weight, made an average daily gain of 0.55 lb. per head on pumpkins alone, consuming 31.4 lbs. of the feed per head daily. Analyses of pumpkins and squashes showed that they contain 87 to 91 per cent water, 1.75 to 2.5 per cent crude protein, 1.06 to 0.65 per cent ether extract, 1.5 to 2.1 per cent crude fiber, and 3.77 to 8.92 per cent nitrogen-free extract. The feeding of the seeds alone was likely to cause indigestion as a result of the high fat content.

[Experiments with poultry at the Crookston Substation], C. G. Selvig (*Minnesota Sta., Crookston Substa. Rpt. 1925, pp. 70, 71*).—Studies of the effect of the age of hens on the hatchability of their eggs indicated that the hatchability was not as good from eggs laid by extremely old or very young breeding stock as from 2- or 3-year-old hens.

In another experiment no cases of leg weakness developed in a lot of chicks receiving cod-liver oil as a supplement to the dry mash, while in a lot not receiving the cod-liver oil several cases of leg weakness developed which disappeared when the affected chicks received cod-liver oil in the mash. In further tests 1 to 2 per cent of cod-liver oil gave as good results as 3, 4, or 5 per cent in the mash.

In comparing buttermilk and meat meal as protein supplements for laying pullets, a lot receiving buttermilk ad libitum laid an average of 101 eggs during the 212-day test, while another receiving 15 per cent of meat meal in the dry mash fed ad libitum laid an average of 112 eggs in the same period. The calculated cost per dozen was 1.3 cts. less in the buttermilk lot.

The second generation of mating of purebred cockerels and mongrel birds resulted in a marked improvement in the hatchability of the eggs and in the uniformity of the color and size of the chicks and pullets used for egg production. The practicability of special feeding and fattening of turkeys before marketing was demonstrated in another test.

[Experiments with poultry at the South Dakota Station], G. L. STEVENSON (*South Dakota Sta. Rpt. 1925, pp. 33, 34*).—In a test of the use of artificial lighting during January and February one lot of 150 birds lighted for the 2-months period produced an average of 31.25 eggs, while an unlighted lot of 100 birds produced an average of only 23.03 eggs.

In a test conducted to determine the effect of high-fiber-content grains on egg production, one lot of 25 birds receiving barley, oats, buckwheat, and emmer produced 21.72 eggs in 2 months, as compared with 36.56 eggs, the production of another lot of birds receiving a ration of corn, wheat, barley, and oats, with a 20 per cent tankage mash. It is pointed out that the birds receiving the high-fiber feed were overfat.

In another experiment one lot of 25 birds fed oats, corn, wheat, and barley laid an average of 23 eggs per bird, while another pen receiving the same feed plus a 20 per cent tankage mash laid an average of 36.6 eggs per bird in the same period.

In a ventilation experiment the best results were obtained with wind-baffler ventilators combined with straw lofts with gable vents or cupolas.

Eggs held for a period up to 10 days before incubation without turning hatched as well as eggs turned during this period. Holding eggs longer than 10 days caused a reduction in the hatchability, though some eggs held 21 days gave a 50 per cent hatch. The hatching percentages from clean and wiped eggs were 83.3 and 80 per cent, respectively, but only 40 per cent of eggs which had been washed hatched and only 16.6 per cent of dirty eggs.

[Experiments with poultry at the Washington Station] (*Washington Col. Sta. Bul. 208 (1926), pp. 35–38, figs. 3*).—The results are briefly reported.

Breeding and selection, J. S. Carver.—In continuing the pedigree breeding work (E. S. R., 54, p. 864), the 595 Single Comb White Leghorns hatched from dams producing over 200 eggs and sires whose dams produced over 250 eggs gave an average production of 235.2 eggs per bird for the year. The 80 Rhode Island Red hens from stock similarly selected produced an average of 217.5 eggs per bird. In studying the relation between conformation and production no correlation was found between different body measurements and production.

Watery whites, J. S. Carver and L. W. Cassel.—An examination of over 4,000 eggs by candling and after breaking showed that the temperature at which the eggs are kept and the length of the storage period had a decided influence on the firmness of the albumen, while feed was not an important factor. Collecting the eggs laid each hour and cooling them in an ice box did not prevent the appearance of watery whites. Eggs stored at a cellar temperature of 70° for three days rapidly became watery.

Feeding, J. S. Carver and L. W. Cassel.—In studies of the comparative value of yeast and diastase as supplements to the college standard laying ration, it was found that these supplements detracted from the ration rather than enhanced its feeding value for egg production. In another test, high egg production resulted from the use of the no-mash method of feeding sour skim milk

plus various scratch feeds, but the standard laying ration proved more profitable.

Report of egg-laying contests for 1925 and 1926, W. H. ALLEN (*New Jersey Stas. Hints to Poultrymen, 15 (1926), No. 3, pp. 4, fig. 1*).—A report of the tenth year of the Vineland international egg-laying contest and the Bergen County international egg-laying contest (E. S. R., 54, p. 766).

Warm water for winter layers, D. C. KENNARD (*Ohio Sta. Bimo. Bul., 12 (1927), No. 1, pp. 26, 27, fig. 1*).—Directions for insulating a pail with straw or excelsior so that hot water will maintain its heat longer.

Viewing English poultry keepers as neighbors across the way, W. C. THOMPSON (*New Jersey Stas. Hints to Poultrymen, 15 (1926), No. 2, pp. 4, fig. 1*).—The author describes some of the principles and practices of English poultry raisers, particularly considering breeding for quality egg production and cross-breeding.

DAIRY FARMING—DAIRYING

[Feeding demonstrations at the Porto Rico Insular Station], F. A. LÓPEZ DOMÍNGUEZ and M. ELLISON (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt., 1925, pp. 39, 127–129; also in Spanish ed., pp. 41–43, 132–134*).—The results of two feeding demonstrations with dairy cattle are briefly summarized.

Powdered skimmed milk for calves.—The cost of raising a calf on powdered skim milk to 180 days of age was $10.80. Raising a similar calf to the same age on whole milk cost $81.

Corn meal v. *breadfruit in a dairy ration.*—Two cows were fed a ration consisting of corn meal, wheat bran, ground oats, cottonseed meal, and linseed oil meal, 1:3:1:1:1. A second lot of 2 cows was fed a similar ration except that breadfruit meal in equal amounts was substituted for corn meal. Lot 1 produced 1,392.5 lbs. of milk, and lot 2 1,581.3 lbs. The cost of a pound of milk was 2.1 cts. in lot 1 and 2 cts. in lot 2.

[Dairy production at the South Carolina Station] (*South Carolina Sta. Rpt. 1926, pp. 62–64*).—Some of the current problems are noted.

The value of grinding hay for dairy cattle.—Two groups of cows were fed for 120 days by the double reversal method, the only difference in the ration being ground and unground alfalfa hay. The palatability of the hay was unaffected by grinding, and there was no marked effect upon the quantity and quality of the milk. The increased cost of 100 lbs. of milk and 1 lb. of butterfat with the ground alfalfa was 9 cts. and 2 cts., respectively.

A digestion trial with 4 cows in milk with an actual digestion period of 15 days and a 10-day preliminary period showed little difference in the digestibility of either ground or unground hay.

Wintering dairy heifers or roughage only.—Two lots of 8 dairy heifers, averaging about 381 days in age, were fed for a period of 90 days. One lot received roughage alone and was kept in an acre lot with an open shed for shelter. The other lot was fed grain and roughage and housed during the night in the barn. Weights and measurements were taken at regular intervals. The roughage consisted of soy bean hay and corn silage the first 60 days and oat hay and sorghum silage the last 30 days. The heifers receiving the grain ration gained 0.39 lb. per head more per day than those on roughage alone. The daily difference in height growth was 0.009 in. per lot in favor of the grain-fed heifers. The difference in weight was due apparently to storage of fatty tissue.

[Feeding dairy cattle at the Vermont Station] (*Vermont Sta. Bul. 260 (1926), pp. 11, 12*).—In continuing the studies of the protein requirements of dairy cattle (E. S. R., 48, p. 173), a series of nitrogen balances were determined

on four cows fed over a period of 12 months. The results indicated that milch cows are able to maintain satisfactory production on less protein than is required by some feeding standards. The coefficients of digestibility of all the nutrients except ether extract were lower than those calculated from average coefficients for the individual feeds included in the ration.

In the study of the maintenance requirements of dairy cows (E. S. R., 48, p. 374), the addition of steamed bone meal and ground limestone to a ration of timothy hay, corn silage, and a grain mixture changed negative calcium and phosphorus balances to positive. Dry cows on winter maintenance rations also assimilated calcium and phosphorus when so fed. The retention of calcium and phosphorus was reduced when the cows were not exercised.

In continuing the study of the effect of cocoa meal on dairy cattle (E. S. R., 52, p. 677), it was found that the bromine content of this feed was apparently mainly responsible for the increase in the fat content and the decrease in the milk flow which occurred when this product was fed. The average coefficients of digestibility of cocoa meal, as determined in 5 trials with cows, were dry matter, 27; crude protein, 37; cellulose, negative; nitrogen-free extract, 40; and ether extract, 89.

[Experiments with dairy cattle at the Washington Station], E. V. Ellington and J. C. Knott (*Washington Col. Sta. Bul. 208 (1926), pp. 18–20*).—The results of two experiments are briefly reported.

A study of calf rations: Powdered buttermilk and semisolid buttermilk.—Eight calves raised on a mixture of 9 lbs. of water to 3 lbs. of semisolid buttermilk or 1 lb. of powdered buttermilk, together with alfalfa hay and a grain mixture, were compared as to their rate of gain in height and body weight with Eckles standards. It was concluded that these substances furnished satisfactory substitutes for skim milk when such was not available at reasonable prices.

Methods of stabling dairy cows.—Studies of the amount of bedding used, amount of labor required, and the cost of construction with steel swinging stanchions with steel stall partitions, wooden box stalls, stalls known as Hoard's Dairyman Model Cow Stall, and a modification of the model stall showed that there was no difference in the time required for feeding and very little difference in the time required for milking. The box stall was the most expensive in all respects, while the model and modified stalls were cheapest to build and required less bedding but a trifle more time for cleaning than did stanchions. The model and modified stalls were much more comfortable for the cows than the stanchions.

Feeding dairy cows, H. O. Henderson and J. V. Hopkins (*West Virginia Sta. Circ. 42 (1926), pp. 22, figs. 2*).—This publication gives the important principles and accepted practices of feeding dairy cows in order to increase milk production. A brief description of the more common feeds and suggestions relating to making and balancing a dairy ration are included.

Twelfth annual report of the creamery license division for the year ending March 31, 1926, W. G. Goss (*Indiana Sta. Circ. 136 (1926), pp. 24, figs. 2*).—This annual report (E. S. R., 54, p. 377) shows the production of dairy products in Indiana, the creameries inspected, the examination of distributors, revoked licenses, and prosecutions. The names of the licensed manufacturing plants in the State are appended.

Producing cream on the farm, J. V. Hopkins and G. M. Trout (*West Virginia Sta. Circ. 43 (1926), pp. 15, figs. 11*).—Methods of producing good milk and cream on farms of West Virginia are explained in this publication. The grades of cream and a list of the absorbed and developed flavors of cream are also given.

[Factors affecting the quality of dairy products] (*Vermont Sta. Bul. 260 (1926), pp. 11, 12, 13*).—In studies of methods of sampling and testing butter for moisture, opening the sample and stirring rapidly just before cooling and immediately before weighing out the portions for analysis has been found to give more accurate and more consistent results than the official method, but stirring with the container open during a considerable portion of the process was found to result in the loss of considerable moisture.

The use of unclean utensils or containers with rusty spots or exposing the cream to bare copper or iron was found to impart undesirable flavors to cream when frozen and stored, but well tinned or lacquered cans had little or no effect on the flavor.

Comparisons of the bacterial plate count and the methylene blue reduction test for determining the quality of milk showed that the latter consistently gave more reliable results.

Studies of the essential factors in the production and marketing of a satisfactory high-grade quality of milk indicated that the elimination of the fore milk tended to reduce the bacterial content, but because of the small quantity of the fore milk the relative effect was slight. Contamination from outside the udder appeared to cause milk to require less time for reduction in the reductase test than the fore milk itself.

Tests of the effect of acidity on the quality of ice cream indicated that the public is able to discriminate between ice cream of high, medium, and low acidity, and that the low acidity product is preferred.

[Factors influencing the quality of butter], T. M. Olson (*South Dakota Sta. Rpt. 1925, p. 21*).—In studying the effect of a starter on the quality of fresh and storage butter, lots of cream were churned without the use of a starter, after ripening with a starter, and after washing the butter with a starter. Starter butter had a somewhat higher score when fresh and also after 6 months' storage. The variation was slight, and the storage period was short.

Frozen cream when thawed developed a flakiness resembling sour cream in appearance, but this had no effect on the length of time required for churning. The butter showed a short grain as soon as massed from the granular condition and after working was completed. The short-grained condition also prevailed in the storage butter.

The effect of processing on the dispersion of fat in an ice cream mixture, W. H. E. Reid and W. K. Moseley (*Missouri Sta. Research Bul. 91 (1926), pp. 25, figs. 11*).—A study of different methods of processing ice cream mixes was made to determine the dispersion of fat. All mixes were pasteurized at 63° C. (145.4° F.) for 30 minutes. A 55-lb. batch was drawn off and cooled to 3° to be used as a check. Five 55-lb. batches were emulsified, one once, the others 2, 3, 4, and 5 times, respectively. Fifty-five-pound batches taken from the viscolized mixtures were processed at pressures of from 500 to 5,000 lbs., varying at intervals of 500 lbs. The pressures used on the two-stage homogenizer ranged as follows: 1,000, 1,500–500 and increased 500 lbs. on the first and second valves up to 5,000–4,000. Ten samples were taken to study viscosity and surface tension. Different samples were used each day for 10 days.

Microscopic studies were made the day the mixtures were processed. Bricks were taken from each sample for scoring, for making hardness determinations, and for determining of effect of temperature on stability.

Processing an ice cream mixture increased its viscosity by increasing the surface area of the fat and causing clumping of the fat globules. Clumping of fat globules was due to adsorption of the protein out of the liquid phase.

Processing increased the surface tension by decreasing the size of the fat globules, decreased the stability of the ice cream, increased the smoothness, and aided in the control of the freezing process.

Concentrated sour skim milk, L. A. ROGERS, W. T. JOHNSON, JR., and H. G. ALBERY (*U. S. Dept. Agr., Dept. Circ. 404* (*1926*), *pp. 8*).—This publication describes the concentration of sour skim milk under a process patented by the senior author for public use.

Since it is practically impossible to concentrate skim milk at ordinary acidity to a state where it may be preserved, the acidity must be increased. The skim milk to be concentrated should be pasteurized either in a continuous machine at 170 to 180° F. or by the holding method. When the milk is cooled to 115°, 2 per cent of mother starter is added and the agitation continued for several minutes. The mixture is allowed to stand overnight and the temperature kept between 105 and 110°, and at the end of an 18-hour ripening period the acidity should be between 1.7 and 2 per cent of lactic acid. The concentration is then carried on to about 28 per cent solids in the same manner as in concentrating buttermilk.

Wooden containers are recommended for the finished product, since the acid attacks metal. The concentrated skim milk, if the acidity is above 5 per cent, will keep indefinitely even at summer temperatures, except that when exposed to air molds appear on the surface.

Classification of the Streptococcus lactis group, B. W. HAMMER and M. P. BAKER (*Iowa Sta. Research Bul. 99* (*1926*), *pp. 281–300*).—This is a proposed classification of the lactic acid producing streptococci, including a general consideration of the *S. lactis* group and a description of the classes under this group, some of which have been previously noted (E. S. R., 47, p. 382; 49, p. 376).

VETERINARY MEDICINE

Some recent advances in veterinary helminthology, T. W. M. CAMERON (In *National Veterinary Medical Association of Great Britain and Ireland, Annual Congress at Cambridge, 1925. London,* [*1925*] *pp. 161–183*).—This is a review of the more recent discoveries as to worm parasites of domestic animals, their prevention and elimination.

Veterinary science, H. J. FREDERICK (*Utah Sta. Bul. 198* (*1926*), *pp. 68–72*).—Feeding experiments to determine the injurious effects of sugar beets and their by-products on horses, sheep, hogs, and cattle are briefly referred to. The data obtained are considered sufficient to lead to the conclusion that beet top silage should not be used in any quantity for horses, but is safe for feeding to cattle, sheep, and hogs. Miscellaneous investigations mentioned include studies of poisonous plants on the range and diseases of dairy cattle, sheep, and poultry.

Annual reports of the official veterinarians of Prussia for 1920–1922 [trans. title], WIEMANN (*Veröffentl. Jahres-Vet. Ber. Tierärzte Preuss., 17* (*1920–1922* [*pub. 1926*], *pt. 1, pp. 3+164, pls. 21*).—This report in continuation of those previously noted (E. S. R., 51, p. 678) deals with and illustrates the occurrence of animal diseases from 1920 to 1922, inclusive, by the use of maps which are inserted.

Annual administration reports of the Civil Veterinary Department in British Baluchistan for the years 1924–25 and 1925–26, N. K. VACHA (*Baluchistan Civ. Vet. Dept. Ann. Admin. Rpts. 1924–25, pp. 16; 1925–26, pp. 17*).—Tabular data which show the occurrence of and control work with infectious diseases of livestock are included in these reports.

Poisonous plants (*Wyoming Sta. Rpt. 1926, pp. 172, 173*).—Studies of three new poisonous plants, a larkspur (*Delphinium venenosum*), a death camas (*Zygadenus washakie*), and the arrow grass *Triglochin maritima*, begun during the year are briefly referred to. The new larkspur was found to be very poisonous, as were the tops of the death camas. Reference is also made to work with the silvery lupine, a bulletin on which was issued during the year (E. S. R., 54, p. 772).

Plant poisoning, J. F. CRAIG and D. KEHOE (In *National Veterinary Medical Association of Great Britain and Ireland, Annual Congress at Cambridge, 1925. London, [1925], pp. 52–113*).—In this paper the authors give a general summary of the present status of knowledge of plant poisoning of livestock as it occurs in Great Britain and Ireland.

Acidosis, trembles, and milk sickness, J. F. COUCH (*Science, 64 (1926), No. 1662, pp. 456, 457*).—The author reports briefly on a biochemical study of animals poisoned by richweed (*Eupatorium urticaefolium* Reichard) and by the rayless goldenrod (*Aplopappus heterophyllus* Blake), the results of which indicate that the animals so poisoned suffer from an acidosis. It is pointed out that the fact that excretion of acetone does not begin until after the onset of the characteristic trembling suggests that the ketogenesis may be a secondary effect of the intoxication. It is considered probable that the toxic principles of these two plants are excreted in the milk of lactating animals, and that the suckling young of animals feeding on these plants may be poisoned and exhibit the characteristic symptoms, such as trembles and acidosis. Consequently, human beings who drink milk or eat butter obtained from cows that have grazed on either of these plants are in danger of being poisoned.

Effects of the administration of sugar, magnesium sulphate, sodium citrate, and dilute acid on the liver damage done by carbon tetrachloride, A. C. CHANDLER and R. N. CHOPRA (*Indian Jour. Med. Research, 14 (1926), No. 1, pp. 219–226, pls. 3*).—The authors have determined that carbon tetrachloride is extremely toxic to cats, very much more so than to dogs. The liver of cats is damaged in the same way as in dogs, but more severely, and in addition the kidney undergoes a profound degree of degeneration accompanied by copious albumin in the urine. Practically the same results were obtained from 0.25, 0.5, and 4 cc. per kilogram. The experiments indicate that administration of sugar simultaneously with carbon tetrachloride tends to delay death for a day or two. Sugar given a few hours before carbon tetrachloride without a second dose simultaneously with it does not appear to have any protective effect. Administration of sodium citrate, tending to increase the alkalinity of the intestines, somewhat reduces the toxicity, while administration of dilute hydrochloric acid increases it. A magnesium sulfate purge also tends to reduce toxicity. In dogs there was found a very considerable individual difference in susceptibility to carbon tetrachloride, but always much less than in cats. A dose of 2 cc. per kilogram caused a central necrosis of the liver lobules, usually amounting to 50 to 75 per cent liver destruction without obvious symptoms. No significant protection resulting from administration of sugar before or with carbon tetrachloride could be demonstrated.

Relation between the chemical constitution and germicidal activity of the monohydric alcohols and phenols, F. W. TILLEY and J. M. SCHAFFER (*Jour. Bact., 12 (1926), No. 5, pp. 303–309*).—This is a contribution from the U. S. D. A. Bureau of Animal Industry, in which the authors report that phenol coefficients have been determined for a number of primary, secondary, and tertiary normal alcohols and paraphenols. "When these coefficients are converted from the original gram weight basis to a gram molecular basis the

coefficients of successive members of each series are found to increase almost uniformly, with an average ratio between coefficients of 3.36 for the primary normal alcohols and of approximately 3.0, 2.7, and 3.3 for the secondary normal alcohols, tertiary normal alcohols, and paraphenols, respectively."

The exudate from nutrient agar slants—the so-called water of condensation, D. J. Healy (*Jour. Bact., 12 (1926), No. 3, pp. 179, 180*).—This is a contribution from the Kentucky Experiment Station which led to the conclusion that the so-called water of condensation which collects in nutrient agar slant tubes is an exudate from the nutrient agar, possessing nutrient substances suitable for sustaining bacterial growth.

An epidemiological study of endemic typhus (Brill's disease) in the southeastern United States, K. F. Maxcy (*Pub. Health Rpts. [U. S.], 41 (1926), No. 52, pp. 2967–2995, figs. 5*).—The author finds that a disease giving a positive Weil-Felix reaction, and clinically indistinguishable from typhus fever except with regard to its relative mildness and low fatality rate, is endemic in the southeastern United States.

"The epidemiology of this disease appears to differ significantly from that of Old World typhus. The epidemiological characteristics afford no evidence suggesting louse transmission and are interpreted as being at variance with man-to-man transfer by lice, unless it be assumed at the same time that the disease occurs mostly in unrecognizable form. It is suggested as an hypothesis which seems to afford a more probable explanation of the mode of transmission that a reservoir exists other than in man, and that this reservoir is in rodents, probably rats or mice, from which the disease is occasionally transmitted to man."

Division of veterinary science, J. W. Kalkus (*Washington Col. Sta. Bul. 208 (1926), pp. 41–43*).—Work with abortion of cattle is reported upon, the results from which still show that the presence of infection at the time of full-time calving in abortion-infected cows is the exception rather than the rule. An attempt made to infect two negative heifers during pregnancy by feeding milk per orum gave negative results. An attempt made to determine the tenacity of the organism under varying conditions has shown that cultures may be exposed in bright sunlight as long as 4 hours and still remain viable. Cultures kept at room temperature, varying from 55 to 85° F., in dark closets remained viable in some instances as long as 20 days. Cultures exposed to the elements with the temperature ranging from a few degrees below freezing to 80° remained alive in some instances as long as 87 days. Cultures kept in a refrigerator in a temperature of from 42 to 45° F. remained alive as long as 45 days, and those kept in a dairy barn as long as 26 days. It is pointed out that sterility in adult cows following abortion appears to be due to secondary infection rather than the specific abortion infection.

Red water experiments commenced January, 1924, with heifer calves in an attempt to produce artificial cases have given negative results.

The nature of Bacterium abortus infection in the udder of the bovine, R. A. Runnells and I. F. Huddleson (*Cornell Vet., 15 (1925), No. 4, pp. 376–390, pls. 2*).—This is a contribution from the Michigan Experiment Station. In summarizing the account, the authors point out that, while *B. abortus* was not observed in the histopathological sections, there is circumstantial evidence to incriminate it as being the agent which caused inflammatory foci in the tissues of the udder, and that this conclusion is strengthened by the fact that no other microorganism was isolated from the milk of these cows. A histopathological study of these udders confirms the findings of Cooledge (E. S. R., 41, p. 578) and Tweed (E. S. R., 51, p. 81) that there is a relation of high cellular counts to *B. abortus* infection of the udder.

Bovine abortion—prevention and control—further remarks, M. F. BARNES (*Jour. Amer. Vet. Med. Assoc., 68 (1926), No. 4, pp. 429–442*).—The author here outlines the Pennsylvania plan for the prevention, repression, and eradication of bovine infectious abortion.

[Report of zoology department of Wyoming Station] (*Wyoming Sta. Rpt. 1926, pp. 178, 179*).—In work during the year with the tapeworm *Thysanosoma actinoides*, it was found that material from this parasite scattered over the grass and at the edge of a small pond failed to infect young lambs, and that but one lamb was infested with *Moniezia expansa*. In studies of the muscle parasite of sheep, *Sarcocystis tenella*, it was found that rats can be infected directly when they eat the spores, and that during the time when they are migrating from the intestinal tract they have a very damaging effect on the health of the animal.

Experiments with mixtures of anti-hog cholera serum and hog cholera virus, J. W. BENNER (*N. Y. State Vet. Col. Rpt. 1924–25, pp. 231–235*).—In the experiments here reported the immunity produced by injecting serum and virus in tissues far enough apart to insure separate absorption proved to be of somewhat higher grade than that produced by the use of the mixture made in vitro and in vivo.

"No product as a result of a neutralization of virus by serum which would permit a decrease in dosage of the latter was observed in either the fresh or stock mixtures. Each entity seemed to retain its properties and action, regardless of the short period of contact as in the case of the fresh mixture, or the long period of contact as in the case of the stock mixture. The stock mixture in the experiment described conferred a desirable grade of immunity in animals vaccinated as long as two months after the mixture was made."

[Surra experiments], K. SINGH (*[Punjab] Camel Specialist Ann. Rpt. 1924–25, pp 3+3+12*).—The author reports experimental treatment of surra in equines by intravenous administration of tartar emetic on alternate days with encouraging results. In the treatment of surra in camels and equines with Bayer 205, rapid improvement resulted. In the experimental work the first full dose of tryparsamide, followed by a dose of tartar emetic, did not disperse trypanosomes from the peripheral circulation of the surra-affected animal for 6 days. In transmission experiments negative results were obtained with all but one of the three species of tabanids tested, namely, *Tabanus ditaeniatus*, with which in 2 of 11 experiments transmission took place. Further transmission experiments with *Ornithodorus crossii* (E. S. R., 49, p. 157; 54, p. 872) have shown that this tick is capable of transmitting the disease up to 212 days after an infected meal.

The effect of chemicals in the control of poultry diseases.—I, Preliminary experiments with bacillary white diarrhea, H. G. MAY and H. E. SEGELIN (*Poultry Sci., 6 (1926), No. 1, pp. 36–41*).—This is a contribution from the Rhode Island Experiment Station in which the authors deal with toxicity and infection experiments.

Potassium permanganate 1 : 1,000, hydrochloric acid 1 : 250, mercuric chloride-sulfocarbolate mixture 1 : 10,000, resorcin 1 : 250 and 1 : 400, and sulfuric acid 1 : 500 failed to show any effectiveness in reducing mortality of chicks artificially infected with *Salmonella pullorum*. Hypochlorite in a dilution containing 0.02 per cent free chlorine in four trials involving 80 chicks reduced the mortality over 50 per cent and is considered to warrant further investigation. With the exception of hydrochloric acid and the hypochlorite solution, which produced gains in the infected chicks equal to those of the uninfected controls, none of the chemicals showed any decided benefit to the surviving chicks and in some instances they were harmful rather than beneficial. Fifty per cent of

the mortality of infected chicks occurred from the fifth to the eighth day, the peak appearing on the fifth day. The agglutination test performed on surviving chicks about three weeks after infection revealed only a few sporadic reactors.

Problems arising in the control of bacillary white diarrhea, L. D. BUSHNELL and W. R. HINSHAW (*Poultry Sci., 5 (1926), No. 6, pp. 249–256*).—This is a contribution from the Kansas Experiment Station, read at the annual meeting of the American Association of Instructors and Investigators in Poultry Husbandry, at Manhattan, Kansas, in August, 1925. A list is made of the facts which should be brought under very careful study, the status of which is briefly considered.

A preliminary note on the bacteriophage of fowl cholera [trans. title], L. BROUDIN (*Compt. Rend. Soc. Biol. [Paris], 95 (1926), No. 35, pp. 1332, 1333*).—The author records the discovery in November, 1925, of the antifowl cholera bacteriophage in the bone marrow of the tarsus of a fowl that had succumbed to the disease. The investigation here reported upon was conducted at the laboratory of animal microbiology at the Pasteur Institute of Saigon.

The bacteriophage in relation to Salmonella pullora infection in the domestic fowl, N. J. PYLE (*Jour. Bact., 12 (1926), No. 4, pp. 245–260, pl. 1*).—This is a contribution from the Massachusetts Experiment Station in which the author reports upon studies made of the intestinal contents, fluids, and tissues from the domestic fowl, with a view to locating and identifying a bacteriophage lytic for *S. pullora* in these materials. Methods were employed for increasing the lytic activity of the avian bacteriophage in vitro to the end of using it as a therapeutic reagent in avian therapeutics. The data presented and observations made have led the author to consider the following conclusions justified:

"Tissues of the domestic fowl do contain bacteriophages causing lysis of various strains of *S. pullora*. Up to the present time, although these avian 'phages' are lytic for *S. pullora*, it has not been demonstrated that they are specific only for this organism. When agar slant cultures of *S. pullora* are treated with liquid cultures of these avian bacteriophages which are lytic for *S. pullora*, watery, moth-eaten, or pellucid areas are demonstrated. This fact, together with the demonstration of the transmission of bacteriophagy for *S. pullora* in series would indicate that the transmissible bacteriolysis is a living ultramicroscopic entity. These reactions of the avian bacteriophage are characteristic of d'Herelle's 'bacteriophagum intestinale.' Although the bacteriophages isolated and studied have demonstrated marked bacteriolysis in vitro, the evidence from animal experiments does not indicate that as now prepared and used they have much therapeutic effect in freeing the bird's body of infection. Bacteriophages actively bacteriolytic for *S. pullora* have been isolated from domestic fowls showing a high agglutinative titre for this organism."

A list of 26 references to the literature is included.

Fowl plague, E. L. BRUNETT and S. KONDO (*N. Y. State Vet. Col. Rpt. 1924–25, pp. 209–224*).—Following a brief reference to the occurrence of this disease abroad, the authors report upon its occurrence in New York State, the nature of the disease and its etiological factor, the infecting dose of the virus blood, and the thermal resistance, longevity, and transmission of the virus. A list of 43 references to the literature is included.

A new and efficient method for removing intestinal parasites from poultry, J. W. IRELAND and A. R. LAMB (*Poultry Sci., 6 (1926), No. 1, pp. 42–49*).—The authors point out that according to various estimates farm poultry are from 25 to 75 per cent infested with one or more of the three most common

varieties of intestinal worms, namely, the large roundworm (*Ascaris inflexa*), the common tapeworm (*Taenia infundibuliformis*), and the small round cecum worm (*Heterakis papillosa*), which cause tremendous losses to the poultry industry. They here describe a method that is considered very efficient in removing the large roundworm and the common tapeworm. The birds are treated individually by use of a syringe containing a mixture consisting of oil of chenopodium, thymol, turpentine, and cottonseed oil.

AGRICULTURAL ENGINEERING

[Irrigation, drainage, and soil physics studies at the Utah Station] (*Utah Sta. Bul. 198 (1926), pp. 51–56*).—The progress results on snow surveys, on flood and gravel control, and on fundamental soil moisture constants are briefly reported.

It was found by W. Gardner and O. W. Israelsen that if the angle of contact of the surface of contact of water and soil grains is zero, a soil kept in a dark chamber can not be in equilibrium with saturated water vapor without becoming completely saturated with water. This leads to a new interpretation of the so-called hygroscopic coefficient, in that it becomes a measure of the moisture condition at equilibrium between soil and water in the presence of light, but this moisture condition changes with the intensity of the light.

Some experimental evidence has been accumulated indicating that the angle of contact involves the curvature of the surface of separation of the liquid and solid phases. It is suspected that the surface tension, heretofore regarded as a constant for a given liquid and a given solid, may itself vary over a slight range for varying curvature. Further conclusions indicate that heavy soils may be completely saturated at various levels above the water table.

[Irrigation investigations at the Irrigation Substation], C. C. Wright (*Washington Col. Sta. Bul. 208 (1926), pp. 62–65, fig. 1*).—The progress results of studies on the economical use of irrigation water and on alkali and the reclamation of alkali soils are briefly reported (E. S. R., 54, p. 875).

Surface water supply of the Great Basin, 1921 (*U. S. Geol. Survey, Water-Supply Paper 530 (1926), pp. V+194, pls. 2*).—This report, prepared in cooperation with the States of Idaho, Utah, Nevada, California, and Oregon, presents the results of measurements of flow made on streams of this basin during the year ended September 30, 1921.

Surface water supply of Hudson Bay and upper Mississippi River basins, 1923 (*U. S. Geol. Survey, Water-Supply Paper 565 (1926), pp. V+199, pls. 3*).—This report, prepared in cooperation with the States of North Dakota, Minnesota, Wisconsin, Iowa, Illinois, and Missouri, presents the results of measurements of flow made on streams in these basins during the year ended September 30, 1923.

United States Government master specification for varnish, spar, water-resisting (*U. S. Dept. Com., Bur. Standards Circ. 103, 4. ed. (1926), pp. 6*).—The text of the specification is given.

Synthetic motor spirit from mixtures of carbon monoxide and hydrogen [trans. title], E. Audibert (*Chim. et Indus. [Paris], 13 (1925), No. 2, pp. 186–194; trans. in Fuel, 5 (1926), No. 4, pp. 170–177*).—Experiments are reported which draw attention to the catalytic activity of binary compounds containing oxygen having sufficient reducing power to oxidize spontaneously in air. These unsaturated compounds bring about the hydrogenation of carbon monoxide. Mixtures of carbon monoxide and hydrogen were found to undergo with suboxides the change expressed by the equation $CO_2+2H_2=CH_3OH$, from

which it is calculated that 82 per cent of the calorific value of the gas may be recovered in the form of liquid fuel.

Lubricating value as related to certain physical and chemical properties of oils, L. W. PARSONS and G. R. TAYLOR (*Indus. and Engin. Chem., 18 (1926), No. 5, pp. 493–496, figs. 5*).—A brief review of the theory of lubrication is given, together with a discussion of the application of this theory to a few special cases, with particular reference to the value of certain tests.

The rôle of oiliness in industrial lubrication, W. C. WILHARM (*Indus. and Engin. Chem., 18 (1926), No. 5, pp. 463–467, figs. 3*).—The importance of efficient lubrication is outlined, and the mechanism and possibilities for improving this factor, especially as it applies to electrical machinery and such other types as are not subjected to high temperatures, are discussed. The property of oiliness is considered as a means of improvement, and a modified inclined plane is described as a method of measuring this property.

A number of determinations were made with a brass plate and steel slider lubricated with several typical lubricants. The results showed a difference in the lubricating value of various lubricants that is not shown in the tests usually made.

A comparison of a Pennsylvania crude with a lubricating fraction of the same material showed that the process of refinement was not detrimental to the oiliness property of the oil.

The conclusion is drawn that the secret of good oiliness is to have a tenaciously adsorbed film of such thickness that the projecting asperities can not interlock. The friction would thus be a function of the attractive forces of the metals, the tensile strength of the metals, and the internal friction of the lubricant. It is thought that this may partly explain why soft bearing metals such as the babbitts give lower resistance than the harder metals.

Surface action and fluid film lubrication: Some film thickness measurements, A. E. BECKER (*Indus. and Engin. Chem., 18 (1926), No. 5, pp. 471–477, figs. 17*).—Studies are reported which showed that to obtain fluid film lubrication there must be adequate adhesive forces between the lubricant and the bearing surfaces. This indicates four general types of bearing combinations. An apparatus for measuring the film thickness developed is described, and data for four oils and four bearing combinations are reported.

The general equation for film thickness in terms of load, speed, and viscosity is found to be

$$t=K\left(1-\frac{\log P}{A}\right)\left(1-\frac{\log S}{B}\right)\left(1-\frac{\log \mu}{C}\right)$$

in which K, A, B, and C are constants depending upon surface action forces, P is the load, S is the speed, and μ is the absolute kinematic viscosity.

The rôle of graphite in lubrication, F. L. KOETHEN (*Indus. and Engin. Chem., 18 (1926), No. 5, pp. 497–499, figs. 6*).—Tests on a Riehle machine to determine the amount of pressure required to rupture the fluid film in a 3-in. bearing rotating at constant speed and measurements of the coefficient of friction of weighted sliders, in each case using oil with and without suspended graphite, are reported.

Both methods of test showed that under conditions of ruptured film lubrication with some solid-to-solid contact the presence of graphite substantially reduced the friction. Graphite was found to be effective in prolonging the period of unbroken film lubrication and in the ruptured film stage reduced friction and minimized metallic contact. This is explained on the basis that it deposits to a certain extent in the low places of the metal, thus making a smoother surface, and that when solid-to-solid contact does take place it abrades more readily and with less friction and damage than would plain metal surfaces.

Some little understood factors affecting lubrication, E. G. Gilson (*Indus. and Engin. Chem., 18 (1926), No. 5, pp. 467–470, figs. 12*).—Studies are reported which showed that changes in friction can not always be satisfactorily explained by changes in viscosity of the oil due to a change of its temperature. Oil film friction is shown to be influenced by a change of one of the metals between which the film is working and also by changing from an oxidizing to a nonoxidizing atmosphere. It is demonstrated by means of a complete bearing within an inclosure how the friction is affected by the atmosphere surrounding the bearing.

It is concluded that the facts shown can not be explained by the viscosity-temperature changes of the oil, and it is suggested that efficient lubrication may depend upon a reaction between the metals of the bearing and the oil, the nature of which is influenced by the atmosphere in which the bearing is operated. The reaction seems to be accelerated when both oxygen and moisture are present.

Oil flow in plain bearings, D. P. Barnard, IV (*Indus. and Engin. Chem., 18 (1926), No. 5, pp. 460–462, figs. 6*).—This paper describes a simple method of developing the approximate laws controlling oil flow through bearings, due both to the pressure developed in the film and to oil feed pressure, and presents some experimental data in substantiation of this method.

Power and the viscosity of oil, W. F. Parish (*Indus. and Engin. Chem., 18 (1926), No. 5, pp. 525, 526, figs. 2*).—Studies are briefly reported from which the conclusion is drawn that the value of the lubricant for use under modern conditions in continuous lubrication systems is not entirely indicated by the viscosity of the oil when new.

Lubrication data from coöperative fuel research, S. W. Sparrow and J. O. Eisinger (*Indus. and Engin. Chem., 18 (1926), No. 5, pp. 482–485, figs. 4*).—A continuation of studies by the U. S. Bureau of Standards is reported which give data on crank case oil dilution, the effect of dilution on viscosity, and viscosity requirements. The data indicate that in general breakaway torque is not affected by changes in the viscosity of the oil upon the cylinder wall, regardless of whether these changes are produced by a change in temperature of the jacket water or by a change in the original viscosity of the oil in the crank case. Similar results were obtained when the engine was rotating very slowly. At higher speeds, however, a marked influence of viscosity upon engine friction was apparent.

These results are taken to indicate that when an engine is started, or when it is being rotated extremely slowly, practically all of the oil is squeezed out from between the rubbing surfaces and lubrication is dependent almost entirely upon the so-called oiliness film. This belief is supported by the fact that the addition of 5 per cent of lard oil containing 2.9 per cent oleic acid reduced the breakaway torque by about 25 per cent.

Principles underlying the use of equilibrium oils for automotive engines, R. E. Wilson and R. E. Wilkin (*Indus. and Engin. Chem., 18 (1926), No. 5, pp. 486–490, figs. 7*).—This paper presents a theoretical analysis of crank case oil dilution and the development of the fundamental laws, assuming that dilution approaches an equilibrium condition in the crank case. Experimental data from road tests and dynamometer trials were obtained to determine the constants and to test the validity of these laws.

These data show that under average conditions the crank case oil loses about two-thirds of its viscosity in the first 150 miles of winter service, and thenceforth remains practically unchanged if operating conditions are constant. In order to make an oil which will give satisfactory starting and cold lubrication and will at the same time have sufficient viscosity at all times in the average

engine, it is suggested that a heavy oil of from 425 to 525 seconds viscosity at 100° F. be blended with from 10 to 12 per cent of a distillate having a boiling range substantially identical with that found in the average crank case at equilibrium. It is possible, by this means, to produce an oil with an initial viscosity of about 200 seconds which gives easy starting and adequate cold lubrication, and yet is so near the average equilibrium dilution that in general it maintains an optimum viscosity throughout its entire service. The results of extensive tests of such oils are presented.

Motor carbon deposits formed under controlled conditions from typical automobile oils, C. J. LIVINGSTONE, S. P. MARLEY, and W. A. GRUSE (*Indus. and Engin. Chem., 18 (1926), No. 5, pp. 502–504, figs. 3*).—Apparatus developed at the Mellon Institute of Industrial Research is described which consists of a small single-cylinder motor provided with a special lubricating system, permitting circulation of a very small charge of lubricating oil, and with devices enabling the very close control of the head, oil, and intake temperatures, the amount of fuel, and the composition of the fuel mixture, as well as the load on the motor and its speed. The modified motor can be so operated as to permit close duplication of conditions, and, with a given lubricating oil, the carbon deposits in the combustion chamber can be checked very closely in a series of runs.

By use of this apparatus results are reported from which the belief is expressed that there is a close connection between the volatility of an oil and its carbon depositing tendency. If an oil contains a fair proportion of hydrocarbons nonvolatile at the prevailing temperature of the metal surface, such as a steam-refined cylinder stock, this residue will progressively crack and oxidize to sticky and asphaltic materials, which will gradually bake into dense, adherent deposits. If, on the other hand, the oil can distill off fairly cleanly it will probably take much longer to produce a deposit of equal thickness. In addition it appears that a deposit from such a volatile oil will contain a small amount of binding material, and will therefore be more friable than a deposit from a higher boiling oil.

The tractor on California farms, L. J. FLETCHER and C. D. KINSMAN (*California Sta. Bul. 415 (1926), pp. 35, figs. 27*).—The purpose of this bulletin is to aid the farmers of California in the choice and successful operation of their field power and to impress upon manufacturers and dealers the need of supplying tractors of the proper design and type to meet the special requirements for farming in California. The information presented is based on data obtained from replies to questionnaires sent to all known tractor owners in the State and from contact with tractor owners.

Electricity in Oregon agriculture, G. W. KABLE (*[Corvallis]: Oreg. Com. on Relation of Elect. to Agr., 1926, pp. 48, figs. 22*).—This is the 1926 annual report of the Oregon Committee on the Relation of Electricity to Agriculture, the investigational work of which is conducted by the Oregon Experiment Station (E. S. R., 53, p. 891).

In the work with electricity in poultry raising the use of electric lights in laying houses during the short winter days has been found to result consistently in increased egg production. The cost of power for lights and extra feed consumed is relatively small compared with the increased returns, the cost of installing the lights being the more important item of expense. Electric brooders have been found satisfactory if properly operated. Electricity for brooding usually costs more than oil, but eliminates much of the labor and most of the hazard. See also a previous note (E. S. R., 56, p. 481).

Studies on the use of electricity in horticulture have shown that the capacity of a dehydrator is approximately doubled by recirculating part of the heated

air with a fan. The amount of fuel used per ton of dried product is decreased, the operation of the dehydrator is under better control, and the dried product is usually better and more uniform where the air is recirculated. The construction cost of dehydrators per ton capacity is less for the recirculation than for the natural draft type. The use of electric motors as sources of power for driving fans has been found to introduce greater reliability for continuous service, more uniform power, and lower cost for labor in operating and for repairs. Electricity for lights and for power to operate oil burners, water pumps, traying machines, graders, and washers in dehydration plants has been found to save labor and result in a better product.

The electric power required for grinding feed with mills now on the market has been found to average a little more than 0.5 kw. hour per 100 lbs. of grain. Feed can usually be ground in less time than it can be sacked, hauled to town, and returned.

Work with electric hay hoists showed that an electric hay hoist will replace a team and possibly an extra man and horse during haying. The power used in putting hay in the barn was less than 0.5 kw. hour per ton. It was found that a hay hoist should be simple, and the power required should be no more than 5 h. p. and preferably 3 h. p. A satisfactory hoisting speed is from 150 to 200 ft. per minute, and the pullback speed should be no greater than the hoisting speed. The drums should be not less than 6 in. in diameter and preferably larger. It is not essential to have a clutch on a single-drum hoist if there is a sliding gear to free the drum. Drums should always be provided with brakes and should be free running when the clutch or pinion is disengaged. In large barns and where large amounts of hay are handled, a double-drum hoist with cable speeds of 200 ft. per minute is desirable.

Other data are reported on electric pumping for irrigation, hoisting earth from a well, the operation of silage cutters, elevating grain and shavings, and shearing sheep.

Electric development as an aid to agriculture, G. E. Tripp (*New York: Knickerbocker Press, 1926, pp. VII+78, pls. 6, figs. 2*).—This book contains chapters on power on the farm, the farm problem, restoring the balance between industry and agriculture, power and its distribution, and the future of national electric service.

Farm lighting systems, M. M. Jones (*Missouri Sta. Bul. 243 (1926), pp. 19, figs. 4*).—Three types of farm lighting systems are described, namely, the acetylene and individual electric types and the system receiving energy from the rural electric line. The results of a questionnaire to determine the degree of satisfaction that each of these types is giving in actual use are also presented.

The data on acetylene plants indicate that the greatest objections are time and trouble of recharging, high cost, and the fact that this system can not be used for power. The cost of light from this system is not high as compared to electric lights and is very little, if any, higher than light from kerosene lamps. The greatest disadvantages of individual electric plants are the expense, the time and trouble required to care for the plant, and the inability of the plant to operate large motors. It is stated that a rural electric line is the ideal source of electricity for the farm where it can be economically secured.

RURAL ECONOMICS AND SOCIOLOGY

[Rural economics investigations at the Ohio Station], J. I. Falconer (*Ohio Sta. Bimo. Bul., 12 (1927), No. 1, pp. 28–32*).—The results of work in rural economics are given.

Less land area required to feed Ohio horses.—Based on the decrease in the number of horses in Ohio from 1910 to 1925 and on cost studies showing that horses on farms with tractors were fed 15 per cent less than those on nontractor farms, it is estimated that 1,194,000 acres, or approximately 10 per cent of the total crop acreage, used to produce feed for horses within the State in 1910 are no longer necessary for that purpose.

Ohio farm and city valuation as shown by index numbers, 1915 to 1925).—Index numbers (1915 valuation=100) are given by years for city and farm real-estate values in Ohio as appraised for taxation from 1913 to 1925 and for farm land values as reported by the crop-reporting service. From 1915 to 1925 the value of real estate increased 187 per cent in Cleveland, 125 in Columbus, 90 in Cincinnati, and 115 per cent in all cities and incorporated villages, while that for farm land decreased 3 per cent.

Labor requirements for corn production in 1907–1912 v. 1920–1924.—The production of an acre of corn required 36 hours of man labor and 48 hours of horse labor in 1907–1912, and 25 hours of man labor and 38 hours of horse labor in 1920–1924. The distribution of man labor among various operations is shown for 1907–1912 and for 1920–1927.

Index numbers of production, wages, and prices.—Index numbers previously noted (E. S. R., 56, p. 285) are continued through October, 1926.

[Investigations in agricultural economics at the South Carolina Station] (*South Carolina Sta. Rpt. 1926, pp. 21–31, figs. 2*).—The results obtained on a number of projects not previously noted (E. S. R., 55, p. 588; 56, pp. 84, 286) or noted from Bulletin 233 on page 582 are reported on.

Special farm management study of Seneca community.—The average capital per farm was about $12,000, and the average acreage about 100 acres, of which approximately 30 acres were in cotton and 22 acres in corn, oats, and other grains. About 20 acres of crops were grown per man-equivalent and 19 acres per work animal. One hundred and seventy work units per man and 90 per mule were obtained annually. Nearly $500 worth of food and other products for family use were produced per farm.

Production, supply, and demand study of Greenville trade area.—Cotton is the principal money enterprise. Farm organization could be improved by growing more feeds and foods for farm use and local sale. Dairying, poultry raising, and truck growing offer opportunities.

Cotton marketing study.—Considerable discrepancy was found between buyers' and government grades for identical cotton in the Orangeburg, Barnwell, and McCormick markets, and also between local prices and the prices in central markets at Augusta and Atlanta, Ga. A study of gin and seed conditions showed that not all farmers were using the best seed, and that proper precautions were not being taken at the gins to keep seed pure.

A comparison on the basis of net income of twenty profitable and twenty unprofitable farms of Lincoln County, L. E. Long (*Mississippi Sta. Circ. 67 (1926), pp. 6*).—The 20 most profitable and 20 least profitable farms, selected on the basis of records of 80 farms collected for the year 1924, show a net cash income of $1,298 and minus $47, respectively. Tables are given comparing for the two groups the averages for the investment in real estate and working capital, utilization of land, acreage of different crops, cash sales of and prices received for different crops, items of farm expenses, amount and cost of fertilizers, cash sales of and expenses on livestock, numbers of different kinds of livestock, etc.

Some farming changes in southwestern North Dakota, 1922 to 1925, R. E. WILLARD (*North Dakota Sta. Bul. 201 (1926), pp. 19, fig. 1*).—The results obtained by the farm management survey of 159 farms made in 1923, previously noted (E. S. R., 52, p. 291), are compared with similar data from 130 of the same farms obtained by the 1925 agricultural census of the U. S. Bureau of the Census.

Size of farm varied from 160 to 3,600 acres in 1922 and from 160 to 8,080 acres in 1924, but the average size decreased from 817 to 770 acres. Farms less than 480 acres tended to increase in size and those over 480 acres to decrease, from 480 to 640 acres appearing to be considered the economic unit. The average number of acres per farm owned and rented decreased from 578 to 537 and from 239 to 233 acres, respectively.

The average value per farm of real estate decreased from $17,270 in 1922 to $11,315 in 1925, of livestock from $2,186 to $1,918, and of machinery from $1,743 to $1,375. The farms doing a small business maintained the value of their livestock, and those having current expenses of $1,000 to $2,000 increased their machinery investment.

The average acreage in crops increased from 276 to 279 acres, the change being due to increases of 1 acre each in alfalfa, oats, and barley, 26 acres in flax, 5 acres in corn, and 4 acres in sweet clover and decreases of 22 acres in wheat, 6 acres in rye, and 7 acres in other crops. Horses increased from 11.3 to 11.7 head per farm; milk cows decreased from 10.3 to 9.2, and other cattle increased from 20.6 to 26 head; and sows increased from 2.5 to 5.2, other hogs from 1.4 to 13.4, and poultry from 74 to 90 head. The percentage of farms operating tractors increased from 30 to 39.

The average assets and liabilities per farm both decreased approximately 29 per cent, being $23,084 and $3,468, and $16,493 and $2,473, respectively, for the two years. In 1922 full owners operated 29 per cent of the farms and owner tenants 71 per cent, and in 1924 full owners operated 36, owner tenants 60, and tenants 4 per cent.

A study of economic conditions in the Lexington-Batesburg section of South Carolina, B. A. RUSSELL (*South Carolina Sta. Bul. 233 (1926), pp. 36, figs. 12*).—This bulletin deals primarily with the organization of the farm business, the factors affecting income, and the cost of production of the more important crops of the section. It is based upon records gathered from 141 farms in 1924.

The average farm comprised 185 acres, of which 71 acres were in woods, 20 in pasture, 9 in tillable land lying out, 12 in waste land, and 73 acres in crops as follows—cotton 27.4 acres, corn 25.1, oats 11.3, wheat 3.4, rye 1, and miscellaneous patches, garden, and truck 4.8 acres. The cash crops were cotton, averaging 69.3 per cent of the gross receipts; asparagus and corn, each averaging 4.4 per cent of the receipts; and peaches. The average total investment per farm was $13,708, distributed as follows: Land $7,450, buildings $3,426, cash $1,237, livestock $663, feed and supplies $588, and machinery and equipment $344. The farm receipts averaged $2,747, expenses $1,832, farm income $915, labor income $230, return on capital 4.9 per cent, and operator's earnings $1,221. The net return on cotton was $19.48 per acre, or 6.5 cts. per pound, and asparagus $52.27 per acre. The cost of developing asparagus to 4 years of age was $109.41 per acre, and of producing peaches 58 cts. per bushel at the orchard unpacked.

A survey of the cattle industry in the Nebraska sand hills, H. HEDGES (*Nebraska Sta. Bul. 215 (1926), pp. 22, figs. 2*).—The results are given of a survey made in 1925, in cooperation with the U. S. D. A. Bureaus of Agricul-

tural Economics and Animal Industry, of the operations from April 1, 1924, to March 31, 1925, of 71 ranches in the sand hill region of Nebraska. The average size of the ranches was 7,749 acres, the value of the ranch real estate $47,813, and the ranch personal property $29,078. The average total receipts were $8,965, expenses $5,288, and interest on borrowed money $2,236. Allowing $987 for wages for operator and family, the return on the operator's equity in capital invested was 0.99 per cent. Fifty of the ranches reported real estate mortgages and 51 chattel mortgages, only 15 per cent being free of both. Interest rates varied from 5 to 9 per cent for real estate and from 6 to 10 per cent for chattel mortgages. A comparison of the 15 best and 15 poorest ranches showed the following, respectively: Total investment $62,140 and $84,684; receipts $9,654 and $6,666; expenses $3,890 and $5,823; percentage of income to investment 9.28 and 1.0; number of cows 247 and 262; percentage of calves to cows 78.0 and 66.9; death losses among all cattle 0.77 and 0.86 per cent and among cows 0.76 and 1.20 per cent; labor cost per head $4.21 and $4.98; months of labor per 100 head 8.5 and 9.3; cattle cared for by one man 142 and 130; receipts from range cattle 84.7 and 88.2 per cent, from other livestock 5.4 and 9.0 per cent, from livestock products 3.4 and 1.2, and from crops and other sources 6.5 and 1.6; total receipts, percentage of total investment 14.3 and 6.8; cattle receipts, percentage of cattle investment 37.3 and 28.2. Pasture management, ownership v. leasing of land, age and quality of cattle for marketing, markets, etc., are discussed.

Economic aspects of citrus-fruit growing in Polk County, Fla., C. R. SWINSON and W. C. FUNK (*U. S. Dept. Agr. Bul. 1435 (1926), pp. 40, figs. 11*).—This report is based upon the study of the records of 100 citrus grove farms from 1917 to 1922. The farms averaged 41 acres, of which 9.7 acres was woodland, 3.7 waste land, and 27.6 acres tillable land, 26 acres of which was in crops, 7.6 being in bearing grapefruit, 9.7 in bearing oranges, 1.1 in other bearing citrus fruits, 1.5 in nonbearing grapefruit, 4 in nonbearing oranges, 0.4 in nonbearing tangerines, and 1.8 acres in hay and other crops. The citrus situation in the United States, the section studied, the selection of a grove site, the organization of citrus farms, and grove operations and practices of the section are described.

The average capitalization per farm in the section increased from $20,656 in 1917 to $41,776 in 1922, and the net return to capital and for supervision varied from $1,213 to $6,680, averaging $4,192 per farm. The cost of developing an acre of citrus grove up to and including the fifth year, allowing $125 for cost of land and charging interest at 8 per cent, was $536.

Harvesting and marketing cantaloupes and honey dew melons in the Arkansas Valley of Colorado, seasons of 1924 and 1925, N. D. SANBORN (*Colorado Sta. Bul. 312 (1926), pp. 59, figs. 21*).—The harvesting,, standardization and inspection, and marketing methods and practices in the Arkansas Valley district are described. The average cost per acre and per crate of harvesting and marketing and the average returns realized from the 1924 and 1925 crops are shown. The gross sales of cantaloupes in 1925 amounted to $333.39 per acre, of which 10.5 per cent went for labor, 11.8 per cent for materials, 0.2 per cent for association dues, 0.4 per cent for inspection, 42 per cent for freight, and 15.1 per cent for commission. The gross sales of honey dew melons in 1925 were $488.78 per acre, of which 6.7, 16, 0.15, 0.35, 43.4, and 15.4 per cent, respectively, went for the various items of expense. Gross sales per acre in 1924 were $2.86 less for cantaloupes and $8.84 for honey dew melons, but the expenses absorbed 5 and 4 per cent, respectively, less of the gross receipts.

An economic study concerning the operations of fruit and vegetable shippers in western New York, R. B. Corbett (*New York Cornell Sta. Bul. 453 (1926), pp. 67, figs. 7*).—This bulletin presents the results of an investigation to ascertain the costs of the marketing services performed by fruit and vegetable shippers in western New York and the margins taken by them. The data were determined for apples in barrels, apples, peaches, and pears in bushels, and cabbage in bulk.

Of the amount returned to shippers for all products studied in 1922–23, 69.6 per cent was paid to growers, 27.6 per cent went for handling charges, 2.3 for allowances, and 3.1 for management costs, leaving a loss of 2.6 per cent, which was reduced to 1.6 per cent by the income from by-products. In 1923–24, 92.9 per cent of the return to shippers was paid to growers, the handling costs equaled 27.7 per cent, allowances 0.6, management cost 3.9, and income from by-products 0.9 per cent, leaving a loss of 24.2 per cent to the shippers. Of the city sale price of the total shipments on consignment in 1922–23, 28.6 per cent went to pay costs from the shipping point to the first sale in the city, leaving 71.4 per cent for the shipper. The grower received 55.9 per cent of the city sale price. In 1923–24, the costs from the shipping point to the first sale in the city absorbed 27.2 per cent of the city sale price, leaving 72.8 per cent for the shipper. The grower was paid 81 per cent of the city sale price, making a loss of 8.2 per cent for the shipper.

The average cost per barrel of storing 45,600 barrels of apples from October, 1923, to May, 1924, was 72.2 cts. and the shrinkage 3.8 per cent.

The products shipped were widely distributed, being sold in from 41 to 129 markets in from 13 to 27 States and countries in 1922–23, and in from 24 to 143 markets in from 9 to 24 States in 1923–24. An appendix includes a description of the method of calculating costs of handling each product and copies of the forms used in collecting the data.

Great Lakes—St. Lawrence deep waterway: Its value to North Dakota, O. M. Fuller and A. H. Benton (*North Dakota Sta. Bul. 204 (1927), pp. 36, figs. 17*).—The need of North Dakota for cheaper transportation and the value of the proposed Great Lakes-St. Lawrence deep waterway to the State are discussed. It is estimated that the proposed waterway will increase farm prices, due to reduced freight costs, on exports to Europe by 5.6 to 12 cts. per bushel on grains and $11 per short ton on pork and pork products, and that the estimated reduction on freight costs of poultry and eggs will be at least 50 per cent. Examples of the probable savings in costs of foods and raw materials for manufacture shipped into the State are given.

Federal aid as a part of a long-time agricultural policy, with special reference to the distribution of tax levies, E. Englund (*Kansas Sta. Bul. 237 (1926), pp. 54, figs. 12*).—This is a general study of the present policy of Federal aid for research in agriculture and for agricultural extension, vocational education, and rural highway construction. Its purpose is to indicate the relation of this policy (1) to the general public welfare and (2) to the distribution of the tax levies, particularly in agricultural States such as Kansas. The precedents for, the constitutionality, and the principal criticisms of Federal aid are discussed. An analysis is made of the National and State relations in Federal aid as regards (1) the State and local initiative, (2) the diversion of funds to purposes of subordinate local importance, and (3) the fairness in the distribution of taxes among the States.

The acts of Congress providing Federal aid for research and education in agriculture and for road construction have given broad scope for State and local initiative, and the actual workings of such acts have stimulated such

initiative and afforded opportunity for cooperative self-help in local communities. That the people have shown their preference for the public services given Federal aid is evidenced by the fact that the State and local expenditures for each dollar of Federal funds averaged $6.11 in 1924 for agricultural experiment stations, $2.13 for agricultural extension in 1923, $2.90 for vocational education in 1924, and $13.79 for road construction in 1925, notwithstanding that the Federal acts require no matching of funds in the case of the agricultural experiment stations and only dollar for dollar matching in the case of the other funds. The opinion that Federal aid results in an unfair distribution of taxes among the States overlooks the facts (1) that the States as such pay no Federal taxes; (2) that taxes are not always paid where collected, i. e., are shifted; and (3) that the benefits of Federal aid are not confined to the State in which the money is expended.

Industrial and commercial development have brought about an enlargement of the economic unit—the territorial unit in which there is substantial economic interdependence, but the size of the local taxing units—counties, townships, school districts, etc.—in which the major share of the taxes (85 to 89 per cent in Kansas from 1910 to 1923) is levied, has remained the same. These small taxing units within large economic units probably result in an unfair distribution of tax levies, especially where, as in Kansas, tangible property is the main source of revenue. Federal aid partly offsets the disadvantages of the small taxing units, and it is probable in the future that public functions which are general in character will receive relatively more support from the larger taxing units than in the past.

Taxation of farms in Missouri, C. O. Brannen and S. D. Gromer (*Missouri Sta. Research Bul. 93 (1926), pp. 19*).—The investigation reported was made in cooperation with the U. S. Department of Agriculture. General property taxes, which form the bulk of farm taxes, constituted 85 per cent of the revenues from taxes in 1890 and 83.2 per cent in 1922. The average tax per acre on farm lands increased from 8 cts. in 1881 to 15 cts. in 1913, and from 23 cts. in 1919 to 40 cts. in 1923 and 1924. A survey of cash-rented farms in 23 counties in the northwestern part of the State showed that the average net cash rents were $3.09 in 1913, $3.83 in 1918, and $4.26 in 1922, while the average taxes per acre were 35 cts., 36 cts., and 73 cts., respectively. On selected farms in Audrain, Boone, Gentry, and New Madrid Counties the average net rent per acre decreased from $4.71 in 1919 to $3.73 in 1923, while the average taxes per acre increased from 47 to 75 cts. The ratio of the assessed valuation to the owners' estimated valuation in these four counties increased from 14.6 per cent in 1919 to 105.1 per cent in 1923, as compared with an increase from 54.6 to 64.6 per cent for the values of from 19 to 68 pieces of city real estate in the same counties. The 5-year average percentage of capitalized net rent of owners' estimated value for the period 1919–1923 was 45.7 per cent for rural and 84.2 per cent for urban real estate. The assessed value of 246 pieces of rural real estate transferred in 1924 in 6 Missouri counties was 62.7 per cent, as compared with 55.4 per cent for 340 pieces of urban real estate transferred.

The farmer's taxes in Boone County in 1924 were distributed 9.9 per cent for State purposes, 45 for county purposes, and 45.1 for special district purposes, and 27.9 per cent was used for administrative and general expenses, 38.7 for education, 17.1 for highways, and 16.3 per cent for miscellaneous purposes. The actual contribution of the States to common school purposes decrease over $1,378,000, or nearly 28 per cent, from 1921 to 1924.

The steps suggested to counteract the inequalities in taxation are (1) that property taxes be made to reflect more fully the variations in the earning capacity of different classes of property, (2) that a large proportion of all taxes be obtained from sources other than property, and (3) that the State assume a greater part of the cost of administration, schools, roads, and other government costs.

Some tax problems of North Dakota farmers, R. W. NEWTON and A. H. BENTON (*North Dakota Sta. Bul. 203 (1926), pp. 63, figs. 32*).—The amount of taxes paid by farmers in North Dakota, how the money raised is spent, the causes of recent increases in taxes, and some of the methods of making farm taxes less burdensome were studied.

The tax on farm real estate is estimated to have increased from 23 cts. per acre in 1916 to 55 cts. in 1922, and then decreased to 48 cts. in 1924. More than 40 cts. per acre has been spent annually for local purposes since 1920. General property taxes, exclusive of the hail tax, on selected farms in Traill and Wells Counties in 1919 to 1924 and Hettinger County in 1921 to 1924 averaged from 14 to 18.3 per cent of the net rent in 1919, from 23.5 to 85.1 per cent in 1920 to 1923, and from 13.8 to 19.2 per cent in 1924. Four-fifths of the population of the State is rural. Rural land, livestock, farm implements, and agricultural products in 1922 represented 66.6 per cent of the taxable wealth of the State, railroads 14.1, and city real estate 8.6 per cent, consequently the possibility of transferring farm taxes to other property is limited. General property taxes levied in 1923 were distributed as follows: State 13.36 per cent; county 22.16; city, town, and village 8.49; township 8.18; and schools 47.81 per cent. The inequality between farm and other taxes resulted from a pronounced lack of stability in the value of farm products, and that between farm taxes in different sections to the variations in the assessed valuation per child and cost per child of maintaining schools up to the State requirements in different counties and districts in the same county, the lack of uniformity in the relation of assessed to actual valuation of property, and the variation in the benefits from roads received by different persons in proportion to the road taxes paid.

Some suggestions made for reducing and making more equitable distribution of taxes are as follows: (1) Levies should be fixed after harvest time, (2) industrial development should be encouraged, (3) distribution of State school funds should be on a basis of educational cost rather than per child basis, (4) school taxes should be more uniform throughout the county, (5) higher motor vehicle and higher gasoline taxes should be levied, (6) state-wide taxes should be levied to supplement motor taxes for primary roads, (7) local roads should be under county control, (8) county taxes should be lowered by using a shortened ballot and longer terms of office, (9) township assessments should be revised, and (10) township and school district treasurers abolished.

Cotton prices and markets, A. B. COX (*U. S. Dept. Agr. Bul. 1444 (1926), pp. 78, figs. 16*).—The fundamental factors involved in cotton price making are analyzed, and the character, organization, functions, etc., of the different types of cotton markets are described. Special attention is given to price making in the futures market and to problems involved in arriving at correct conversion ratios for spot and futures contracts.

Monthly Supplement to Crops and Markets, [December, 1926] (*U. S. Dept. Agr., Crops and Markets, 3 (1926), Sup. 12, pp. 385–440, figs. 3*).—The usual tabulations, summaries, and notes are given regarding crops, dairy products, cold-storage holdings, fruit and vegetable shipments, livestock and livestock products, prices and price movements of agricultural products, seeds,

exports of grain, and world agriculture. Special reports are included on the acreage sown and condition of winter wheat and rye December 1, the December 1 pig survey in the 11 Corn Belt States, and the tobacco production in 1926. Tables are given showing (1) the acreage, production, December 1 price, farm value, etc., by years and by States from 1924 to 1926 of cereal grains, forage crops, fruits and vegetables, tobacco, and cotton; (2) the estimated prices of farm products, November 15, 1925 and 1926, by States, with comparisons for the United States with previous years; (3) monthly farm prices, 1908–1926, of important farm products; (4) the yearly value per acre, 1866–1926, of the 10 leading field crops combined; and (5) the estimated aggregate value, 1919, 1924, 1925, and 1926, by States, of 22 leading crops.

Membership relations of cooperative associations (cotton and tobacco), J. W. Jones and O. B. Jesness (*U. S. Dept. Agr., Dept. Circ. 407 (1927), pp. 29*).—This study, made in cooperation with the Kentucky Experiment Station, was undertaken to determine the causes of weak membership morale, dissatisfaction with associations, and contract violations in centralized cooperative marketing associations in the South. The answers to a schedule from approximately 150 to 460 members of two cotton and two tobacco associations with memberships of from 35,000 to 108,000 and operating over an entire State or parts of more than one State are tabulated and discussed. The schedule covered members' opinions and criticisms regarding their organization; reasons for joining; benefits obtained; members' ideas as to purposes, possibilities, and limitations of such associations; degree of satisfaction and anticipations realized; causes of dissatisfaction; members' knowledge of the association and its operation; etc.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Proceedings of the fortieth annual convention of the Association of Land-Grant Colleges and Universities, edited by S. B. Haskell (*Assoc. Land-Grant Cols. and Univs. Proc., 40 (1926), pp. 432, figs. 8*).—Lists of the officers, committees, and delegates; the constitution of the association; the minutes of the general sessions and the several sections; and the reports of the officers and committees of the convention, held at Washington, D. C., November 16–18, 1926, and previously discussed (E. S. R., 55, pp. 701, 798; 56, p. 1), are published here. The following papers and addresses not hitherto referred to, together with discussions, are included: Report on behalf of the American Council of Education, by C. R. Mann; The Correlation of the Curricula of the Arts Colleges and the College of Agriculture, by A. Vivian; Freshman Week and Orientation, by R. G. Bressler; The Allocation of Subject Matter to Departments of Instruction, by C. Betten; Agricultural College Enrollment, by C. F. Curtiss; Some Factors Affecting Tenure in Extension Work, by W. A. Lloyd; Developing an Economic Background for an Extension Staff, by F. W. Peck; Factors to be Considered in Enlarging an Extension Organization, by R. McCann; Home Economics Extension, by M. Van Rensselaer; Engineering Degrees, by O. M. Leland; Engineering Teachers—General Discussion, by E. H. Rockwell; What Can Be Done to promote the Development of Engineering Teachers? by F. C. Bolton; Cooperation Among Deans for the Selection and Advancement of Teachers, by A. Marston; When Should Young Teachers Obtain Their Professional Practice? by J. W. Votey; Control of Service Courses of the Engineering Curricula, by D. S. Kimball, H. S. Boardman, O. J. Ferguson, E. A. Hitchcock, M. S. Ketchum, and E. J. McCaustland; Index to Programs and Papers of the Engineering Section, Association of Land-Grant

Colleges, 1913 to 1926, by O. M. Leland and D. R. Hyman; Placing Young Graduates in Suitable Positions, by C. R. Jones, G. W. Bissell, A. A. Potter, and R. L. Wales; Major Objectives in Home Economics Education, by F. D. Farrell; Major Objectives in Home Economics, by L. Bane; Present Status of Minimum Requirements for a Degree in Home Economics, by M. Van Rensselaer; Factors Affecting the Minimum Requirements for a Degree in Home Economics, by F. R. Lanman; Adjusting Home Economics Instruction to Changing Conditions in Home Life, by A. L. Marlatt; Our Responsibility for Offering Service Courses, by M. Fedde; Report on Child Development and Parental Education, by A. E. Richardson; and A Five Year Administrative Program in Home Economics Extension, by G. E. Frysinger.

First annual report of the New York State College of Home Economics at Cornell University, 1926, C. BETTEN ET AL. (*N. Y. State Col. Home Econ., Cornell Univ., Ann. Rpt., 1 (1926), pp. 28*).—This is the first annual report and includes a brief summary of the development of home economics work in Cornell University from 1900.

Ten years of successful institutes, E. L. LUTHER (*Wis. Agr. Col. Ext. Circ. 209 (1927), pp. 16, figs. 8*).—The developments in farmers' institute work are discussed. The most important developments were the increasing use of trained specialists of the College of Agriculture on institute programs; the unification of the work of the institute and the county agents; the combination of service in information with service in materials; the greater stress on farm business, especially cooperative marketing; and the development of specialized institutes devoted entirely to cooperative marketing of a single commodity. The program of the first cooperative marketing institute held in November, 1925, is included.

Chemistry for agricultural students, R. H. ADIE (*London: Univ. Tutorial Press, 1926, pp. VIII+357, figs. 99*).—A textbook designed to show students of agriculture how the fundamental facts and inferences of chemistry and physics have a bearing on practical work and observations.

FOODS—HUMAN NUTRITION

Nutrition and health, H. C. SHERMAN (*Indus. and Engin. Chem., 18 (1926), No. 12, pp. 1261–1263; also in Baking Technol., 6 (1927), No. 1, pp. 20–24*).—This and the following paper were presented at the Round Table Conference on The Rôle of Chemistry in the World's Future Affairs at the sixth session of the Institute of Politics, Williamstown, Mass., on August 24, 1926.

A concise discussion is given of the requirements for an adequate diet, the distinction between adequate and optimal nutrition, and the best means of improving the utilization of the primary crops now produced so as to make optimal nutrition possible. In the author's opinion this would consist in converting a larger share of grass and grain into milk and less into meat. "The energy and protein of the material eaten is much more economically converted into human food by the milch cow than by the animal which is fed merely for slaughter, and what is now seen with special force is that the conservation of the vitamins and mineral elements so important to the human food supply is incomparably more efficient in the conversion of feed into milk than into meat."

The present and the future of the food supply, E. B. FORBES (*Indus. and Engin. Chem., 18 (1926), No. 12, pp. 1263–1267*).—This paper consists chiefly of a discussion of the economics of food supply and demand, with emphasis upon the part played by chemistry in food production. In regard to the question of

dairy cattle v. beef cattle, the author states "at the present time there is no competition between man and the domestic animals for food in this country. The animals perform a definite and most important service of conservation of foods either unavailable or unwanted for human consumption. With the tightening of economic conditions, however, as we approach the limit of population, we shall have no choice but to increase the proportion of vegetable foods in the diet, and to discontinue the raising of cattle for beef alone; shall make increasing use of dual-purpose types of cattle; and eventually may have to depend for our beef solely upon that resulting as a by-product of the dairy industry."

A bacteriological study of canned salmon, C. R. FELLERS (*Jour. Bact., 12 (1926), No. 3, pp. 181–202*).—The study reported covered a period of five years in which 7,674 cans of salmon, comprising 540 separate lots, were examined bacteriologically. Of these, 5,276 cans proved to be sound and normal and 2,398 of doubtful quality. Of the sound cans, 3.4 per cent were found to be nonsterile and 0.9 per cent were rejected on bacteriological grounds. Corresponding percentages for the cans of doubtful quality were 7.1 and 1.6 per cent. Among the bacterial groups isolated in decreasing order from the nonsterile cans were sporulating aerobes, cocci and nonsporulating rods, true thermophiles, obligate anaerobes, and molds.

Inoculation experiments showed that many sporulating aerobes grow well in canned salmon, producing a softening of texture, abnormal odor, and discoloration but no gas or marked spoilage. *Clostridium botulinum* grew vigorously in canned salmon even at low temperatures, but this organism has never been found in commercially canned salmon and no outbreaks of botulism have been attributed to this food. The Salmonella group was absent, and it is believed that food poisoning from this source is very rare with canned salmon.

Home demonstration work, 1923, O. P. MALCOLM (*U. S. Dept. Agr., Dept. Circ. 399 (1926), pp. 48, figs. 18*).—The reports on home demonstration work from the States in 1923 are reviewed and summarized.

Baking qualities of Wyoming flour (*Wyoming Sta. Rpt. 1926, pp. 176*).—In this preliminary report it is noted that higher temperatures are required to bake bread in a given time at high than at low altitudes. At an altitude of 7,150 ft. a temperature of 475° F. was required to bake a loaf weighing slightly more than 1 lb. in half an hour.

Peas in the diet, A. L. MARLATT (*Wis. Agr. Col. Ext. Spec. Circ., Oct., 1926, pp. 23*).—In addition to a general discussion of the subject, this circular contains selected recipes for the use of canned peas in soups, salads, mixed vegetable dishes, and in combination with meats, cheese, eggs, and fish. Translations of French, Italian, and Armenian recipes and English recipes dating back to 1100 A. D. are included.

Effect of fruit acids on fruit flavors in jellies and jams, C. P. LATHROP and W. L. WALDE (*Canner, 64 (1927), No. 2, pp. 40, 41; also in Canning Age, 8 (1927), No. 1, pp. 42, 43; Fruit Prod. Jour. and Amer. Vinegar Indus., 6 (1927), No. 5, pp. 11, 12, 27*).—The authors call attention to the fact that the technique of jam and jelly making is not limited merely to questions of pectin content and texture, but that the preservation of the original fruit flavor is of fundamental importance. This has been found to depend largely upon the kind and quantity of acid. Variations of from 0.02 to 0.05 per cent in the concentration of acids such as citric, tartaric, malic, and lactic were found to produce decided differences in the fruit flavor of jellies. The acid content required to bring out the maximum fruit flavor varied only slightly with the different fruit acids used (currant, raspberry, and pineapple). Citric acid in concen-

trations of from 0.5 to 0.55 per cent acid, calculated as anhydrous citric acid, gave the best results. About two-thirds as much by weight of tartaric, malic, or lactic acid was required to produce the optimum fruit flavor, but the flavors were not as good with these as with citric acid. When the correct acidity has been determined the pectin content can be adjusted to give the desired jelly texture under the established proportions of fruit juice, sugar, and fruit acid.

Bonbons, H. Rousset (*Bonbons. Paris: Desforges, Girardot & Co., 1926, pp. 268, figs. 29*).—This collection of recipes for candy making in the home has been compiled largely from American publications.

Development of the food color industry in the United States, W. C. Bainbridge (*Indus. and Engin. Chem., 18 (1926), No. 12, pp. 1329–1331*).—A brief historical survey of the subject from 1880, when the first attempts at standardization of coloring matter for foods were made, to the present time.

The effect of the luxus consumption of meat upon the voluntary activity and growth of the albino rat, F. A. Hitchcock (*Amer. Jour. Physiol., 79 (1926), No. 1, pp. 206–217, figs. 4*).—This study deals with the effect upon the growth of white rats and upon their voluntary activity as measured by revolving wheels of the addition of a liberal quantity of meat to a diet already adequate. This diet, consisting of cakes prepared from whole wheat flour 62.5, dry casein 15, skim milk powder 15, calcium carbonate 1.5, sodium chloride 1, and cottonseed oil 5 per cent, with cod-liver oil in the proportion of 200 cc. to each 100 lbs. of the food, was fed with dry yellow corn ad libitum and cabbage or lettuce once a week. About half of the animals received this stock diet alone and half the same with the addition of 8 gm. daily of fresh lean meat cooked rare.

The total number of rats used consisted of 56 females and 35 males in four groups. The experiment was begun when the rats were 30 days old and continued for nearly a year. After 2½ months some of the rats were subjected to a 5 days' fast, after which the condition of feeding was reversed, the former controls now receiving the meat. During the first 10 months of the experiment no attempt was made to determine the food consumption. Daily weighings and calculations during the last 2 months showed that the control females consumed approximately 13.8 and the control males 15 gm. of the stock ration per day and the meat-fed females 11.4 and males 13.4 gm. in addition to the meat. This made the total intake of the meat-fed rats 61 and 67 calories per day as against 53 and 57 calories for the controls. The protein in the diet of the meat-fed group represented about 36 per cent of the total energy intake and of the control group 29 per cent.

Although the numbers were too small to warrant general conclusions, the data obtained appeared to indicate that luxus meat consumption promoted more rapid growth, with larger weight at maturity, and more rapid and complete recovery from starvation. The voluntary activity was changed only slightly and not consistently.

Although not emphasized in the author's conclusions, the fact that out of 8 females and 6 males dying of unknown causes during the experiment 6 of the females and 5 of the males belonged to the meat-fed series would suggest the possibility that high meat feeding may tend to shorten the life span.

The effect of meat feeding on nursing mother rats and the rate of growth of their litters, F. A. Hitchcock (*Amer. Jour. Physiol., 79 (1926), No. 1, pp. 218–220, fig. 1*).—The diets used in this study were the same as in the preceding except that the meat was not added until the birth of the first litter and was gradually increased in amount from the original 8 or 10 gm. daily

to an amount sufficient to furnish about 1 gm. daily to each of the young after they had begun to eat from the mother's diet. Four female rats mated with males from the same stock were used and the experiment was continued through three generations, 5 females being selected from the meat-fed group and the same number from the control to continue the experiment. In the third generation 2 meat-fed mothers with their litters were taken as controls, 2 control mothers with their litters for the meat feeding, and 2 were continued on the meat feeding.

No data are given as to the numbers in the various litters, but the composite growth curves show in the first two generations a decided advantage in the litters of the meat-fed mothers. In the third generation the total weight of the two control litters whose mothers had previously received meat was 739 gm., of the two meat-fed groups whose mothers had been controls 898, and of the two litters continuing on the meat 1,034 gm., again showing an advantage for the meat. It was also noted that the death rate among the control litters was much higher than among the meat-fed, largely through an epidemic of respiratory infection, which resulted in the death of 27 young of the control and only 5 of the meat-fed group, as well as one of the mothers of the control group and none of the meat-fed.

The effect on the kidney of the long continued administration of diets containing an excess of certain food elements.—I, Excess of protein and cystine. II, Excess of acid and of alkali, T. ADDIS and E. M. and L. L. MACKAY (*Jour. Biol. Chem.*, *71* (*1926*), *No. 1, pp. 139–166, figs. 11*).—In the studies reported in these two papers, special precautions were taken to control all variables except the one under consideration. The period of observation was made sufficiently long to cover what would correspond to 30 years of a man's life, and the control and experimental diets were fully adequate for growth and maintenance and as closely comparable as possible. The control diet in both studies consisted of cornstarch cooked, dried, and powdered 44, powdered casein 16, lard 14, cod-liver oil 10, Osborne and Mendel's salt mixture 4, Harris yeast powder 10, and dried and powdered alfalfa 2 per cent. The food intake was determined every 5 days and the body weights every 10 days. The rats were placed on the experimental diet at 30 days of age and continued to ages of 330 and 360 days.

In the first study the high protein diet used contained casein in place of the cornstarch and lard of the basal diet, making the protein content 69.5 per cent in place of 17.3 per cent. In the cystine experiment 1 gm. of cystine was mixed with 99 gm. of the control diet.

The rats on the high protein diet did not reach the weight of the controls or the cystine group. The average rate of excretion of protein in the urine was higher on the high protein than on the other two diets and higher in the males than in the females. Red blood cells were occasionally found in the urine in all three groups with but slight differences in the different groups. Occasional hyaline casts were found, but no more frequently on the high protein than on the other diets. There was but little variation in the blood urea. On post-mortem examination the principal cause of the relatively low body weight of the high protein rats was found to be an almost complete absence of fat. No difference could be detected microscopically between the kidneys of the three groups, but the weight of the kidneys was higher and of the livers lower in the high protein group.

This study is thought to prove decisively that "rats can live for a third of their life span on a diet very high in casein or with added cystine and yet

escape any damage to their kidneys. This fact leads us to reject the hypothesis that a large consumption of protein is in and by itself necessarily harmful to the kidneys."

In the second study the acid diet was made by mixing 2 gm. of $CaCl_2$ with every 98 gm. of the control diet and the alkaline by mixing 4 gm. $NaHCO_3$ with 96 gm. of the control. On such diets the average H-ion concentration of the urine had previously been found to be pH 6.4 in the control, 5.2 in the acid, and 6.9 in the alkaline group.

The rats on the acid diet, although eating more than the controls, ceased to gain at about the one hundred and twentieth day and lost in weight gradually from then on. The ones on the alkaline diet grew but at a somewhat slower rate than the controls. The most pronounced effect of the diets was a difference in the amount of blood in the urine. There was no blood at all in the acid group, a little in the control, and a large amount in the alkaline, particularly in the male rats. The protein excretion in the urine was much less in the acid group. Blood urea concentrations were within normal. Hydronephrosis of one or both kidneys was present in 7 of 24 rats on the alkaline diet. In the rats on the acid diet the body weight and the weight of the heart per 100 mm. of body length were much less than in the controls. The liver weights were lower on both the acid and the alkaline diets than on the control, but the kidney weights were not appreciably different.

The effect of an excess of vitamins A and B in the ration on basal metabolism and the specific dynamic effect of food [trans. title], A. v. Árvay (*Pflüger's Arch. Physiol., 214 (1926), No. 4, pp. 421–438*).—Data are reported from experiments on rats leading to the conclusion that although the basal metabolism is lowered by a deficiency of vitamin B, an excess of this vitamin does not increase the basal metabolic rate nor does it have any effect on the specific dynamic action of the food. Cod-liver oil as a source of vitamin A was found to increase the basal metabolic rate of rats not only on a vitamin-poor or vitamin-free diet, but also on a vitamin-rich diet. Cod-liver oil also brought about an increase in the specific dynamic action of the food. Butter was without effect. These results are rendered less conclusive from the fact that in no case was the vitamin in question the sole limiting factor in the diet.

On the growth-promoting property of irradiated fat in the diet, of direct irradiation, and of cod-liver oil, H. Goldblatt and A. R. Moritz (*Jour. Biol. Chem., 71 (1926), No. 1, pp. 127–137, figs. 5*).—The experimental data reported in this paper demonstrate the growth-promoting properties of vitamin D, as well as vitamin A, and the ineffectiveness of irradiation in synthesizing vitamin A or mobilizing its reserves in the tissues.

Four groups of rats receiving the same basal diet free from both vitamins A and D were continued on this diet after growth had ceased, group 1 receiving no addition, group 2 being irradiated daily, group 3 receiving irradiated cottonseed oil in place of the untreated cottonseed oil of the basal diet, and group 4 receiving 7 drops (150 mg.) daily of cod-liver oil. Growth was immediately resumed in groups 2 to 4, but after 4 weeks groups 2 and 3 had ceased to gain and were for the most part losing in weight, while most of the rats in group 4 were continuing to gain. The experiment was continued until all the rats in groups 1 to 3, inclusive, had died (20 weeks). At this time 5 out of 8 of group 4 were still living and gaining weight.

A practical conclusion drawn from this study is that neither irradiation nor the feeding of irradiated oil can act as a complete substitute for cod-liver oil in growth promotion experiments unless vitamin A is also given.

Irradiated milk: Its effect on the blood, V. Dawkins and C. L. Pattison (*Lancet [London], 1926, II, No. 26, pp. 1314, 1315, fig. 1*).—The effect of irradiated milk on the blood of 5 children, suffering from acute bone tuberculosis and who had failed to show any improvement after about 4 months on a hospital diet which included cod-liver oil and 1¼ pints of milk daily, was tested by determinations of the red cell count and the hemoglobin percentage of the blood at the beginning of the experiment and at the end of two successive periods of 4 weeks each in which ½ pint of the daily allowance of milk had been irradiated for half an hour at a distance of 2 ft., followed by a period of the same length on ordinary milk and a final period of 3 weeks on the irradiated milk.

The blood count increased steadily during the periods in which irradiated milk was fed and decreased sharply in the one period on ordinary milk. The hemoglobin rose slightly in the first period, remained at about the same level during the second, fell sharply in the third, and was only slightly altered in the fourth period. The red cell counts were in all but one case slightly over 4,000,000 per cubic millimeter at the beginning and considerably over 5,000,000 at the end of the experiment, but the percentage of hemoglobin in all but one case was lower at the end than at the beginning, averaging 76.6 and 70 per cent, respectively. For purposes of comparison, similar analyses were made of the blood of 6 other children between the ages of 2 and 14 years who had received irradiated milk daily for an average of 10 months. The minimum, maximum, and average values for the red cell count were 4,390,000, 5,970,000, and 5,030,000, respectively, and for the hemoglobin 74, 84, and 78 per cent. These figures are thought to indicate that the fall in hemoglobin and rise in red blood cells noted in the first group do not continue indefinitely.

It is noted that there was a marked improvement in the general health and well-being of the children and in the condition of the local lesions after 8 weeks on irradiated milk.

Antirachitic properties developed in human milk by irradiating the mother, A. F. Hess, M. Weinstock, and E. Sherman (*Jour. Amer. Med. Assoc., 88 (1927), No. 1, pp. 24–26*).—In this complete report of the study previously noted from a preliminary account (E. S. R., 56, p. 295), attention is also called to the probable beneficial effect of irradiation on the mother, as well as the child, through preventing the excessive drain of calcium and phosphorous involved in pregnancy and lactation.

Glass screens for the transmission of the light radiations curative of rickets, E. M. Luce (*Jour. Biol. Chem., 71 (1926), No. 1, pp. 187–190*).—This is a preliminary report to the effect that rats on a rickets-producing diet, when irradiated by sunlight for 6 to 7 hours daily through Corning glass filters No. G86B transmitting only 0.5 per cent light of wave length between 300 and 305$\mu\mu$, received no protection against rickets, while in similar experiments with filters Nos. G980A and G986A, transmitting 80 and 77 per cent, respectively, of light of wave length 300$\mu\mu$, there was complete protection against rickets.

Vitamins in their relation to medical supplies, F. H. Carr (*Pharm. Jour. and Pharm. [London], 4 ser., 63 (1926), No. 3294, pp. 729–734*).—A concise summary of present knowledge concerning vitamins A, B, C, D, and E, including their distribution in nature, the most generally used methods for their determination, their physical and chemical properties, and theories concerning their function.

A preliminary study of factors influencing calcification processes in the rabbit, M. Mellanby and E. M. Killick (*Biochem. Jour., 20 (1926), No. 5, pp. 902–926, pls. 3, figs. 7*).—This paper deals chiefly with the use of the rabbit as an experimental animal for studying calcification processes. After trial

of a number of experimental diets, the one adopted as the most satisfactory for securing a moderate rate of growth and at the same time poor calcification consisted of 4 parts of oats to 1 of bran, with 1.5 per cent calcium carbonate fed ad libitum and 6 cc. of decitrated lemon juice daily for each animal. Of 22 rabbits fed this diet, 19 developed definite rickets within 7 weeks and 2 osteoporosis, while 1 remained well with normal bones and teeth. In the authors' opinion the effect of rate of growth upon calcification is of greater importance than the ratio of calcium to phosphorus.

Various supplements to this basal diet were tested. The rabbits were unable to take as much as 2 cc. daily of cod-liver oil for a prolonged period, but with the unsaponifiable fraction from 1 cc. of oil growth was somewhat better than on the basal diet and the general health was improved. With the same amount of cod-liver oil and 20 gm. or more of cabbage daily there was good growth and normal calcification of the teeth and bones. With egg yolk, failure of growth and death resulted after several weeks of improvement except when the diet was further supplemented with cabbage. Of the other materials tested, green grass, especially summer grass, was effective, dandelion leaves fairly so, and cabbage ineffective without cod-liver oil. Of the root vegetables tested, swedes and carrots gave rather variable results, while turnips had no antirachitic effect. The rabbits responded as other animals to irradiation or to the use of irradiated foods.

The use of national foods in treating diabetic patients of foreign birth, F. STERN and J. REYNER (*Jour. Amer. Med. Assoc., 88 (1927), No. 5, pp. 316–322*).—From the authors' experience as dietitians at the food clinic of the Boston Dispensary, suggestions are given for the adaptation of diabetic diets to racial food habits. Two sets of typical American, Jewish, Italian, and Armenian diabetic menus are given, including a low tolerance diet furnishing approximately 75 gm. of carbohydrate, 70 of protein, and 130 gm. of fat, with a total of 1,750 calories, and the Joslin maintenance diet furnishing 159 gm. of carbohydrate, 84 of protein, and 135 gm. of fat, with a total of 2,187 calories.

Specific practical applications of the adaptation of general principles to widely differing racial food habits are given for the principal groups of foods, together with suggestions for the task of teaching foreign patients, many of whom can not read, how to measure their foods. In the scheme which has been found to work most satisfactorily a lump of sugar weighing approximately 5 gm. is used as the unit for the amount of carbohydrate in a 100-gm. portion of a 5 per cent vegetable, and other food quantities are demonstrated in multiples of this unit.

TEXTILES AND CLOTHING

The viscosity of cuprammonium solutions of cotton cellulose, F. C. HAHN and H. BRADSHAW (*Indus. and Engin. Chem., 18 (1926), No. 12, pp. 1259, 1260, figs. 3*).—In viscosity studies made with solutions derived from a representative series of different grades of linters and from four distinct samples of long staple cotton, the figures for the linters samples exceeded those for the long staple cotton. There also seemed to be a progressive rise in viscosity from low grade second cut to high grade mill run linters, and then a drop to first cut linters and a further drop to long staple cotton.

The steeping process.—I, The constituents of cotton soluble in water or dilute mineral acids and the effect of their removal on subsequent scouring, R. G. FARGHER, L. R. HART, and M. E. PROBERT (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 5 (1926), No. 21, pp. 257–273*).—The investi-

gation reported dealt with the amount of material in cottons of different origin which dissolves in water or in dilute mineral acids; its reducing, nitrogenous, and mineral constituents; and the effect of its removal on subsequent scouring. The effects of dilute sulfuric acid on gray and scoured yarns were compared to ascertain the applicability of the copper number determination as a measure of tendering during a gray sour. Typical enzyme preparations used in the desizing of cotton goods were examined for their effects on the constituents of the cotton itself.

The effect of humidity on cotton yarn: The strength and extensibility of sized and unsized warp yarns in equilibrium with steady atmospheric conditions, F. T. PEIRCE and R. J. STEPHENSON (*Jour. Textile Inst., 17 (1926), No. 12, pp. T645–T660, figs. 6*).—Material including warp yarns, spun to a twist factor about 3.8, 4 about 33's count, 1 50's count, 2 being also pure sized and 2 heavy sized, representative of common trade products and spanning a wide range of quality, was tested at humidities from dryness to saturation for single thread breaking load and extension and for ballistic work of rupture. The data obtained appear to have yielded considerable information on the nature of the influence of humidity and of sizing on the yarn properties.

The moisture relations of cotton.—VI, The absorption of water by cotton mercerised with and without tension, A. R. URQUHART (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 5 (1926), No. 24, pp. 303–320, figs. 2; also in Jour. Textile Inst., 18 (1927), No. 2, pp. T55–T72, figs. 2*).—The present research on yarns mercerized with and without tension has confirmed previous findings with loose cotton (E. S. R., 54, p. 93) in that the curves showing the relation between the hygroscopicity of mercerized cotton and the concentration of the mercerizing solution resembled those representing the swelling of cotton fibers in solutions of sodium hydroxide. The changes in the absorptive capacity of cotton caused by mercerization were found to be very similar for all cotton varieties examined. The applied tension acts in opposition to the swelling force, so that the absorptive capacity of cotton mercerized with tension is considerably less than that of cotton mercerized loose.

Mildew in cotton goods.—IV, Antiseptics and the growth of mould fungi on sizing and finishing materials, L. E. MORRIS (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 5 (1926), No. 25, pp. 321–349, pl. 1, figs. 17*).—A preliminary account is given of the progress of inquiry toward the prevention of mildew growth in manufactured cotton goods by the use of antiseptics. The properties of an antiseptic that are essential to satisfactory use in sizing and finishing are chiefly lacks of color, odor, danger to the operative, or of action upon the size, cloth, or machinery. The necessity is emphasized of considering a number of species in determining the efficiency of an antiseptic. The action of some antiseptics varies with the acidity of the medium, some being more and others less effective in fermented than fresh flour.

Winter damage of wet wash, L. B. ALLYN (*Starchroom Laundry Jour., 33 (1926), No. 11, pp. 132, 134, 136, figs. 7*).—Winter damage, usually met with between December and April and more prevalent in middle and eastern United States than in other sections of the country, is found only in cotton goods, and shirts appear to suffer most from this cause. Bacterial infection seems to be the principal source, and laundrymen troubled with this type of damage are urged to leave the wet wash slightly acid rather than neutral or alkaline.

Overall shrinkage (*Starchroom Laundry Jour., 34 (1927), No. 1, pp. 90, 92, 94, fig. 1*).—Tests were made on overalls and overall materials to determine the

shrinkage under various conditions of temperature, "strength" (amount of alkalinity in the detergent) of washing powders, and methods of laundering.

The shrinkage of overalls seemed to be independent of the detergent used. Boiling water did not cause more shrinkage than water of 120° F. The average loss in tensile strength appeared to vary slightly with the detergent used, yet not with the temperature. Excessive pounding due to low water in the washwheel did not cause an increase in shrinkage. Ninety-one per cent of the shrinkage occurred in the first wash. Overalls shrunk as much when washed by a home method as when washed in a commercial laundry.

The chlorination of wool, J. B. Speakman and A. C. Goodings (*Jour. Textile Inst., 17 (1926), No. 12, pp. T607–T614, pl. 1, figs. 2*).—The cause of unshrinkability of wool and the amounts of chlorine needed to produce this condition were studied at the University of Leeds.

The reduction of shrinkage obtained by chlorination of wool seemed due to the formation of a jelly layer between the unattacked cortex and the cuticle of wool by the consecutive actions of chlorine and soap or soda. The bad wearing properties of unshrinkable wool are attributed to the ease with which the jelly layer and its surrounding scales are removable by friction. A process, applicable only to dyed goods, has been devised for shrinking and hardening the jelly layer to the unattacked part of the cortex and thereby improving the wearing properties of the wool. Absolute unshrinkability appears to be attainable under particular conditions, the limiting factor in this respect being the difficulty of insuring even chlorinaton of all fibers, especially where yarns are concerned, on account of the preferential absorption of chlorine by the outside fibers.

Difficulties in handling rayon, G. H. Johnson (*Starchroom Laundry Jour., 34 (1927), No. 2, pp. 102, 104, 106*).—The research department of the Laundryowners' National Association found that the damages to rayon most frequently met with in the laundry include loss of luster after the first washing due to removal of soluble sizing or mechanical finish, dissolving or disappearance of rayon fibers when laundered the first time, shrinkage troubles, distortion of the design caused by employment of a loose weave, poor laundering qualities, damages due to misuse, and tears from faulty handling in the laundry.

The finishing of textile fabrics, R. Beaumont, rev. by A. Yewdall (*London: Scott, Greenwood & Son; New York: D. Van Nostrand Co., 1926, 2. enl. ed., rev., pp. XV+368, figs. 188*).—In its successive chapters this book deals with woolen, worsted, and union fabrics; processes of finishing and their effects; materials used for cloth scouring; scouring machines and the process of scouring; theory of felting-milling agents, fiber and yarn structure, fabric structure, and compound fabrics; fulling and milling machinery; drying processes and machinery; raising and its application to different types of fabrics; raising processes and machinery; cutting machinery; setting and lustering processes and machinery; miscellaneous processes and machinery; and methods of finishing.

Census of dyes and other synthetic organic chemicals, 1925, T. O. Marvin et al. (*U. S. Tariff Comn., Tariff Inform. Ser. No. 34 (1926), pp. IX+224, figs. 3*).—"This report is a survey of the domestic dye and synthetic organic chemical industry in 1925. It presents the results of a special investigation made by the U. S. Tariff Commission with respect to the production in the United States of coal-tar dyes and synthetic organic chemicals, both of coal-tar and of noncoal-tar origin. It includes a detailed tabulation of coal-tar dyes imported into the United States and official statistics of imports and exports of coal-tar dyes by the large consuming and producing nations of the world.

There is also included a chapter on the cost of dye in representative fabrics and garments."

Rabbit skins for fur, D. M. Green (*U. S. Dept. Agr., Farmers' Bul. 1519* (*1927*), *pp. II+14, figs. 7*).—Directions are given for killing and skinning rabbits and for handling the skins from the time the pelt is removed until it reaches the raw fur market. For those who wish to prepare the skins for home use, directions are given for tanning the skins by the salt-acid and salt-alum processes. It is emphasized, however, that home tanned skins do not compare favorably with the commercially tanned skins. A list of 57 different trade names applied to rabbit and hare pelts after they have been prepared for fur manufacturing purposes indicates the extensive use of rabbit fur under different names. It is estimated that more than 100,000,000 rabbit skins are utilized annually in the United States, about 98 per cent of which, valued at approximately $25,000,000, are imported from Australia, New Zealand, Belgium, France, and other foreign countries.

Score cards for judging clothing selection and construction, R. O'Brien, M. Campbell, and M. A. Davis (*U. S. Dept. Agr., Misc. Circ. 90* (*1927*), *pp. II+13*).—These score cards have been compiled by the Bureau of Home Economics from a study of cards submitted by various State clothing specialists. While issued for the special purpose of furnishing uniform standards in clothing contests, they should also serve as useful guides for the construction and selection of clothing. Several references on the construction, design, and economics of clothing and on textile fabrics are included.

Historic costume: A chronicle of fashion in western Europe, 1490–1790, F. M. Kelly and R. Schwabe (*New York: Charles Scribner's Sons, 1925, pp. XV+284, pls. 63, figs. 139*).—This history of costume design in the field of fashionable civil apparel of both men and women covers the years 1490 to 1790, or, roughly speaking, from the time of transatlantic exploration to the French Revolution. Considerable attention is paid to headgear and footgear and to changing modes of dressing the hair. The book is illustrated by reproductions, some in color, of paintings of the period, supplemented by sketches of details of the costumes. Selected costumes of the six periods covered are illustrated further by patterns drawn to scale. An annotated bibliography is appended.

HOME MANAGEMENT AND EQUIPMENT

The use of time by farm women, I. Z. Crawford (*Idaho Sta. Bul. 146* (*1927*), *pp. 14, figs. 4*).—A survey of the present use of time by 49 Idaho farm and 32 town home makers was made by having each report on a special blank her activities in 5-minute units throughout a period of 7 days. The percentages of time spent on the several activities were, respectively, food 15.3 and 13.2, house 10.1 and 8.4, clothing 7.7 and 7.0, family 3.1 and 4.5, management 1.1 and 1.7, sleep and rest 36 and 37.9, self 3.1 and 3.8, leisure 16.8 and 21.8, other work 5.8 and 0.1, and miscellaneous 1.0 and 1.6. Sixty-three of the 81 preferred the work of home making to any other work. Of the town women 28 had running water in the house and 24 used baker's bread entirely, as compared with 19 and 14, respectively, of the farm women. Thirty-five of the farm women had hand-run washing machines. A smaller percentage of the town women had washing machines, but practically all were run by electricity.

Farmhouse kitchen arrangement from the standpoint of household management, G. Gray (*Agr. Engin., 8* (*1927*), *No. 1, pp. 11, 12, fig. 1*).—This is a

contribution from the Nebraska Experiment Station which was presented at the meeting of the American Society of Agricultural Engineers at Lake Tahoe, Calif., in June, 1926. It is based largely on a study of nearly 400 rural Nebraska kitchens.

The results of this study indicated that architects and builders should pay greater attention to storage space and illumination, as well as to the arrangement of equipment. More than half of the kitchens studied did not have enough storage space, most of them being short of room for staples and cleaning supplies. More than half of them did not have adequate artificial illumination, and only a little over half received sufficient daylight.

The domestic oil burner, A. H. Senner (*U. S. Dept. Agr., Dept. Circ. 405 (1927), pp. 30, figs. 23*).—On the basis of the results of tests of a number of oil burners of different design, an attempt is made to give the information necessary for the home owner to select an oil burner.

The results indicate that oil burners are well suited to the requirments of many home owners on account of their convenience and ease of heat control if the prospective purchaser is willing to pay the cost of the change and possibly an increased operating cost. It is stated that several types of burners now on the market afford good combustion of oil fuels, and the tests indicate that there is no material difference in the efficiency of the better makes. Any burner which will burn the fuel without giving off soot or smoke and does not require a great excess of air is considered as satisfactory with regard to combustion. It is stated further that if the present plant when burning coal does not give sufficient heat very probably an oil burner will not improve this condition. In general warm air heaters are less suited to oil burner installations than are hot water or steam plants.

Touching up the old furniture, M. M. Miller (*Ky. Agr. Col. Ext. Circ. 199 (1926), pp. 12*).—Practical information on the retouching and refinishing of old furniture is presented.

MISCELLANEOUS

Sixth Annual Report [of Georgia Coastal Plain Station], 1925, S. H. Starr (*Georgia Coastal Plain Sta. Bul. 6 (1926), pp. 57, figs. 10*).—This contains the organization list and a report of the director on the work of the station. The experimental work reported is for the most part abstracted elsewhere in this issue.

Thirty-seventh Annual Report of the Kentucky Agricultural Experiment Station for the year 1924, Part II (*Kentucky Sta. Rpt. 1924, pt. 2, pp. [2]+281+58+[2], figs. 42*).—This contains reprints of Bulletins 252–256 and of Circulars 32–34, all of which have been previously noted.

Report of Northwest Experiment Station, Crookston, 1925, C. G. Selvig et al. (*Minnesota Sta., Crookston Substa. Rpt. 1925, pp. 84, figs. 4*).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Report of West Central Experiment Station, Morris, 1925, P. E. Miller (*Minnesota Sta., Morris Substa. Rpt. 1925, pp. 46*).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Annual Report of [Porto Rico Insular Station, 1925], F. A. López Domínguez et al. (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt., 1925, pp. 140, fig. 1; also Spanish ed., pp. 141, fig. 1*).—This contains the organization list, a report of the director for the fiscal year ended June 30, 1925, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue.

Thirty-ninth Annual Report of the South Carolina Experiment Station, [1926], H. W. BARRE (*South Carolina Sta. Rpt. 1926, pp. 86, figs. 30*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1926, and a report of the work of the station during the year. The experimental features reported are for the most part abstracted elsewhere in this issue.

Annual Report of [South Dakota Station, 1925], J. W. WILSON ET AL. (*South Dakota Sta. Rpt. 1925, pp. 38, fig. 1*).—This contains a report by the director on the work of the station, a financial statement for the fiscal year ended June 30, 1925, and departmental reports. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Report of the director [of the Utah Station] for the 18-month period from January 1, 1925, to June 30, 1926, W. PETERSON ET AL. (*Utah Sta. Bul. 198 (1926), pp. 72*).—This contains the organization list and a report on the work and publications of the station during the 18-month period ended June 30, 1926. The experimental work reported is for the most part abstracted elsewhere in this issue.

Thirty-ninth Annual Report [of the Vermont Station, 1926], J. L. HILLS (*Vermont Sta. Bul. 260 (1926), pp. 15*).—This report contains the organization list, a financial statement for the fiscal year ended June 30, 1926, and a report of the director on the work of the station. The experimental work reported is for the most part abstracted elsewhere in this issue.

Thirty-sixth Annual Report [of Washington College Station], 1926, E. C. JOHNSON ET AL. (*Washington Col Sta. Bul. 208 (1296), pp. 76, figs. 4*).—This contains the organization list, a report on the work of the station, and a financial statement for the fiscal year ended June 30, 1926. The experimental work reported is for the most part abstracted elsewhere in this issue.

Thirty-sixth Annual Report of [Wyoming Station, 1926], J. A. HILL (*Wyoming Sta. Rpt. 1926, pp. 153–186*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1926, a report of the director on the work of the station, and meteorological observations by F. E. Hepner (see p. 507). The experimental work reported is for the most part abstracted elsewhere in this issue.

NOTES

Michigan College and Station.—The winter radio program, operating from January 10 to April 29, included 320 lectures given by 124 members of the staff and representing 20 departments. The 32 courses were divided between agriculture, home economics, science, liberal arts, and engineering. The agricultural courses included poultry husbandry, forestry, production of quality dairy products, soils, fertilizers and manures, muck farming, soil preparation and fertilization for spring and summer crops, feeds and feeding, farm crops, horticulture, power and its applications, farm explosives, and landscape improvement of the farm home grounds.

The estimated attendance at Farmers' Week, January 31 to February 4, was 7,000. The group conferences, including breeders' associations, press associations, and various crop promotion meetings, were larger than in any previous year.

Dr. Edward D. Devereux has been appointed assistant professor of bacteriology and research worker in the station.

Missouri University.—The degree of doctor of agriculture was recently conferred on Dean F. B. Mumford by the University of Nebraska in recognition of his services to agriculture and agricultural research.

Cornell University.—Attendance at the twentieth annual Farmers' Week reached a total of 5,000 registrants, over 1,000 more than in any previous year.

Ohio State University.—The new animal husbandry building has now been occupied. It is a combined administration, teaching, and laboratory building, with a meat cutting laboratory, a judging arena seating 750 persons, and two livestock classrooms.

The departments of animal husbandry and rural economics, cooperating with the New York Central Lines and various local and national agencies, operated a meat production and marketing train through 16 counties in northwestern Ohio from February 14 to 25. The train included three exhibit and demonstration cars, one of pens of livestock, a second of refrigerated meats, and the third for lecture purposes and motion pictures. The total attendance is estimated at over 5,000 persons.

Washington College.—An attempt to raise the tuition fee from $10 to $25 a semester has been defeated by the State Legislature.

Wisconsin University and Station.—Forty-six representatives of the various service bureaus of the public utility companies of the State attended the three-day course on tree trimming work, with special reference to roadside plantings. At the conclusion of the course, the entire group signed a petition for the continuation and expansion of the work the ensuing year and asked that its opportunities be extended to park boards and commissioners.

The average number of farm visits made annually by Wisconsin county agents increased in the last decade from 381 in 1916 to 587 in 1926. The average number of office calls per year increased in the same period from 1,477 to 1,744. The county agents also used the press much more than ever before, preparing almost six times as many articles per man as 10 years ago.

EXPERIMENT STATION RECORD

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The winter's toll of the ever dwindling number of surviving pioneers in the promotion of education and research in agriculture and related lines in this country has been unusually heavy. Since the beginning of 1927 at least five men and women widely known for their services in developing their respective fields have passed away. Three of these—Dr. Erwin F. Smith, Dr. Frederick B. Power, and Miss Caroline L. Hunt—had been associated for many years with the Federal Department of Agriculture. The remaining pair, Drs. Charles E. Marshall of Massachusetts and Thomas Forsyth Hunt of California, had been practically throughout their entire careers actively identified with the agricultural colleges and experiment stations. In their several specialties of plant pathology, phytochemistry, home economics, microbiology, and agricultural education, each of the five had served long and contributed much.

The death of Dr. Erwin F. Smith occurred April 6, 1927, a few days' sickness ending a scientific career of over 40 years spent entirely in the service of the Federal Department of Agriculture. Graduating from the University of Michigan in 1886 when 32 years of age, Dr. Smith was immediately appointed an assistant in mycology in the Department and eventually was given charge of the laboratory of plant pathology of the Bureau of Plant Industry. It was his fortune to be associated with the Department almost from the very beginning of its activities in this field and from a time when little work was being done anywhere in the United States on the economic side of plant pathology. In the words of a recent biographical note in the *Official Record* of the Department, "he and his associates blazed the trail for this new science, furnishing the initial impetus for nation-wide phytopathological research with such ability and dynamic energy that to-day this branch of science exceeds in the number of its workers any other branch of botanical endeavor in this country."

Much of his early work dealt with peach yellows, one of the most baffling problems of phytopathology. He studied this troublesome disease for about 5 years, clearing away much of the prevailing uncertainty regarding its cause and development through laboratory studies and comprehensive and extensive field experimentation.

From 1888 to 1891 he published a number of papers summarizing his findings, and as these constituted the first comprehensive description and discussion of the disease they attracted wide attention among investigators and practical fruit growers. He differentiated and named the southern contagious peach rosette as distinct from peach yellows but belonging to its general type, and he established the practicability of the control of yellows by the eradication from orchards of diseased trees.

A later and more immediately fruitful study was his work on Fusarium diseases and the fungus infestations of the soil. Previously all members of the form genus Fusarium had been considered to be pure saprophytes, and his studies consequently opened up a new vista of plant parasitism. He also discovered that the Fusarium spores are capable of retaining their virulence for several years in the soil, with the result that the breeding of resistant strains of susceptible crops was successfully undertaken.

In 1893 Dr. Smith entered upon a study of bacterial diseases of plants, one consequence of which was the development of the modern science of plant bacteriology. In 1905 he issued the first volume of a monograph entitled Bacteria in Relation to Plant Diseases, followed by a second volume in 1911 and a third volume in 1914, while his textbook in 1920 entitled An Introduction to Bacterial Diseases of Plants brought the subject into concrete pedagogical form.

No complete account of Dr. Smith's accomplishments can be here attempted, but reference must be made to the phase of his research with which his name is most generally associated—his work on crown gall and its resemblence to cancer in men and animals. His findings of numerous analogies between the tumors of plants and animals attracted world-wide attention and led to numerous honors at home and abroad, including the presidency of the American Society for Cancer Research in 1924 and election to the National Academy of Sciences. He had previously served as president of the Society of Plant Morphology and Physiology in 1902, Section G of the American Association for the Advancement of Science and the Society of American Bacteriologists in 1906, the Botanical Society of America in 1910, and the American Phytopathological Society in 1916, and had received the degrees of doctors of science and laws from the University of Michigan and that of laws from the University of Wisconsin.

Dr. Smith was a prolific writer, a survey of his publications indicating no fewer than 167 titles, exclusive of many reviews, and many of his works were of outstanding importance. Most of his papers were published by the Department of Agriculture, but he was also a frequent contributor to outside journals. One of his final addresses was given at the International Congress of Plant Sciences at Cornell

University last August on the subject of Fifty Years of Phytopathology. This was notable not only as an epitome of the striking scientific accomplishments of the half century, but also as revealing inevitably the large part which Dr. Smith himself had played in developing the field by his personal service and the inspiration of his leadership.

The career of Dr. Frederick B. Power, senior chemist in charge of the phytochemical investigations of the Department, paralleled that of Dr. Smith in several interesting particulars. Both were born in New York State, Dr. Power in 1853 and Dr. Smith in 1854, and to both was accorded the opportunity of active service substantially to the end. Both were resourceful and productive investigators and both were indefatigable writers of much literary ability. Explorers alike of little-known byways of science, both found fame and their best-known opportunity for service when their trails unexpectedly led to a common interest in diseases threatening mankind.

Unlike Dr. Smith, much of Dr. Power's life was spent abroad. In 1880 he received the degree of doctor of philosophy from the University of Strassburg. Returning to this country he was for 3 years in charge of the chemical laboratory of his Alma Mater, the Philadelphia College of Pharmacy, resigning to organize the School of Pharmacy at the University of Wisconsin, and for 4 years he was engaged in commercial work. In 1900, however, he was appointed director of the Wellcome Chemical Laboratories of London and continued in that position for 14 years. From 1916 until his death, which occurred March 26, 1927, he was in charge of the phytochemical laboratory of the Bureau of Chemistry.

Dr. Power thus looked back upon an experience of over 50 years. Most of this time he devoted to a study of the chemical constituents of plants. As Dr. Alsberg, a former chief of the Bureau of Chemistry, has well said, "only those who have themselves cultivated this field know how difficult, how time consuming, how patience taxing is such work." A measure of his success is seen in the fact that he was the author of 129 scientific papers, and that his last year had been spent in the preparation of what was to be an exhaustive monograph, covering the whole field of phytochemistry and which would have summarized his many notable contributions.

Outstanding among his accomplishments in popular interest was his study of the chemical constituents of chaulmoogra oil and his determination of the structural formulas of chaulmoogric and hydrocarpic acids. Chaulmoogra oil has long been known to be of value for the treatment of leprosy, but it remained for Dr. Power by his work on the constituents of the chaulmoogra seeds and the con-

stitution of chaulmoogra acid to lay the foundation on which rests the present-day treatment of leprosy which has been so encouraging.

The decade of his connection with the Department of Agriculture was devoted largely to research on the odorous principles of the apple, peach, and grape. Not long before his death, he completed a study of the ordorous and nonvolatile constituents of the cotton plant, isolating a number of odorous principles which it is thought may be utilized by entomologists and others in the preparation of baits for combating the boll weevil. Not the least valuable of his services, however, was his relations with his associates. To quote Dr. Alsberg again, "he soon became one of the strongest influences in the bureau for fostering that sound scholarship and research spirit, which, under pressure for immediate and practical results, so easily perishes in industrial and research organizations."

The value of Dr. Power's work was widely recognized, and he was the recipient of many honors, including the degree of doctor of laws by the University of Wisconsin, the granting of several gold medals abroad, and election as a fellow of the Chemical Society of London and as a member of the National Academy of Sciences, the last-named a distinction said to have been shared only with Dr. Smith and one other member of the Department. Yet as Dr. Browne, the present chief of the Bureau of Chemistry, has said, "notwithstanding the great eminence which he had attained in the fields of pharmacy and chemistry, Dr. Power was exceedingly modest in manner and showed a strong dislike of the exaggerated publicity which is sometimes given to scientific investigations. . . . In the fields of pharmacy and phytochemistry the results of his work will long remain as outstanding accomplishments of the present era of chemistry. The world of science is much poorer with his passing. There is no one left to take his place."

The death of Miss Caroline L. Hunt on January 27, 1927, removed from the ranks of home economics workers at the age of 62 years not merely one of the pioneers in this relatively new field but a prominent member of that small but farseeing group of women under whose leadership home economics developed from an exposition of cooking and sewing into the broader aspects of to-day. Her sound educational equipment, her restless energy and enthusiasm, and her characteristic idealism and wide sympathies combined to give her a position of influence which was as unique as it was helpful.

A graduate of Northwestern University in 1888, Miss Hunt later carried on graduate work in chemistry both there and at the University of Chicago. In 1895 and 1896 she collaborated with Miss Jane Addams of Hull House in some of the earliest dietary studies made in this country, embracing families in the congested district of Chicago and undertaken under the auspices of the nutrition inves-

tigations of the U. S. Department of Agriculture. The next decade she spent in teaching home economics, five years at Lewis Institute in Chicago and a like period as professor of home economics in the University of Wisconsin. In 1909 she joined the nutrition staff of the Department, continuing with this work throughout its administration in turn by the Office of Experiment Stations, the States Relations Service, and the Bureau of Home Economics until her death.

Miss Hunt came to the Department as one of the comparatively few college women of that time who had received some definite training in home economics and the sciences related thereto. She had specially studied dietetics and thus supplemented the knowledge of the other members of the force engaged in nutrition investigations. One specific accomplishment was her devising of a system which simplified the former elaborate calculations of the results of dietary studies.

Her chief work with the Department, and that for which she became most widely known, was the application of scientific facts about nutrition to everyday food problems. She wrote clearly in comparatively nontechnical language and had unusual ability in graphic and pictorial presentation of subjects relating to food and diet. Her work was incorporated in a number of semipopular bulletins which had a wide circulation and were particularly useful to teachers and students of home economics. Such, for example, were the numerous farmers' bulletins on the economic use of meat and other foods in the home and those portraying the group system of selecting foods for a balanced menu without definite calculation of calories. She was also the author of similar bulletins on good proportions in the diet, food for young children, school lunches, and fresh fruits and vegetables in relation to other staple foods. Publications of this type are now quite common, but when she began her writings the application of the principles of nutrition to practical meal planning in the home was virtually pioneering, and its accomplishment was productive of widespread benefit. As a recent tribute in the *Journal of Home Economics* states, "it is impossible to estimate the influence of her bulletins on the popular literature of nutrition or their share in the progress of health education."

Miss Hunt's activities and influence were by no means restricted, however, to matters of food and nutrition. Not the least of her services to her own and later generations was her biography of Mrs. Ellen H. Richards, which traced with intimate touch and sympathetic insight the history of the whole home economics movement. Such a task she was well qualified to perform, for in addition to technical knowledge she had broad vision and understanding and a far-reaching social philosophy. This is illustrated by the following

passage from a paper entitled Revaluations, originally prepared in 1901 and which typifies the dominant motive of her life: "That which is necessary for good home making can be determined only by holding fast to the highest ideal of home and by having a clear understanding of changing social conditions. . . . The final test of the teaching of home economics is freedom. If we have unnecessarily complicated a single life by perpetuating useless conventions or by carrying the values of one age over into the next, just so far have we failed. If we have simplified one life and released in it energy for its own expression, just so far have we succeeded."

The youngest member of the group was Dr. Charles E. Marshall, who died very suddenly at Amherst, Mass., on March 20, 1927, in his sixty-first year. Although born on an Ohio farm, Dr. Marshall like Dr. Smith was a graduate of the University of Michigan, receiving the degree of bachelor of philosophy in 1895 and that of doctor of philosophy in 1902, while like Dr. Power he had also supplemented his studies in this country by work abroad, spending considerable time in bacteriological laboratories of Copenhagen, Paris, and Berlin. After serving for 3 years as instructor in bacteriology and hygiene at the University of Michigan he was appointed assistant in bacteriology in the Michigan Experiment Station in 1896. Two years later he became bacteriologist and in 1902 professor of bacteriology and hygiene in the Michigan Agricultural College, while in 1908 he was also made vice director of the Michigan Station. In 1912 he resigned to become professor of microbiology in the Massachusetts Agricultural College and dean of its Graduate School, and was in active service in these capacities at the time of his death.

Dr. Marshall was the aurthor of many articles on bacteriology and microbiology, mostly issued under the auspices of the Michigan Station, but including the well-known college text on Microbiology, which appeared in 1911. His own research work was of a high order, notably his studies of the associative action of bacteria in milk and on a number of animal diseases. It was largely because of his high ideals and thorough understanding of research principles and methods that he was placed in charge of the scientific work of the Michigan Station. For this supervision he was well equipped, both by temperament and conviction. A firm believer that in individuality is to be found the very essence of creative work, he none the less steadfastly maintained, as at the 1912 meeting of the Association of the American Agricultural Colleges and Experiment Stations, that "an organization effected to foster research work requires someone in sympathy with it to push it forward." He had much to do with the outlining and conduct of the early work under the Adams

Act, exerting a strong influence in maintaining high standards and otherwise improving the quality of the station work.

Doubtless the same attributes, together with his sound scholarship and special pedagogic training, contributed toward his selection to organize the Graduate School at the Massachusetts Agricultural College. In this undertaking he had been very successful, converting the relatively undeveloped graduate instruction which had been offered for about 18 years to a handful of students to an efficient educational unit with a greatly enlarged enrollment, an adequate and well-organized curriculum, and a deserved national reputation. Important as have been his personal contributions to science, it is perhaps through the work of the many students whom he had assisted on the pathway to a research career that his ideas and ideals will be longest perpetuated.

The death of Dr. Thomas Forsyth Hunt occurred somewhat unexpectedly on April 25, 1927. Dr. Hunt was on shipboard, nearing San Francisco from a trip to Honolulu, where he had represented the University of California at the Pan Pacific Conference on Education, Reclamation, Rehabilitation, and Recreation. He was in his sixty-sixth year.

Dr. Hunt was a native of Illinois and received his collegiate training entirely at that university, obtaining the bachelor's degree in 1884 and the master's degree in 1892. The honorary degree of doctor of agriculture was conferred upon him in 1903 and that of doctor of science by the Michigan Agricultural College in 1907.

Unlike most of the group herein discussed, Dr. Hunt's experience included a wide range of institutions from the East through the Middle West to the Pacific coast. Starting his career as an assistant to the State entomologist of Illinois in 1885, he served in turn as assistant in agriculture in the University of Illinois and its experiment station from 1886 to 1891, as professor of agriculture in the Pennsylvania State College in 1891–92, and as professor of agriculture and later dean of the College of Agriculture and Domestic Science at Ohio State University from 1896 to 1903. From there he was called to the College of Agriculture at Cornell University as professor of agronomy, serving 4 years, and then going back to Pennsylvania as dean of the School of Agriculture and director of the station from 1907 to 1912. In the latter year he was made dean of the College of Agriculture of the University of California, being likewise director of the station till 1917.

In 1923 he relinquished the duties of dean but continued as dean emeritus and also as professor of agriculture. Much of his time since that date had been spent on a survey of agricultural conditions in

California. A comprehensive report of his findings which he had projected was in process of preparation, and it is hoped may be brought to completion by others.

Dr. Hunt's extended service was noteworthy for his participation in a number of pioneer undertakings. While at the Ohio State University, as well as subsequently, he did much to popularize the cause of agricultural education, and his success in securing the erection in 1898 of Townshend Hall, the first of the so-called modern agricultural buildings now to be expected as a matter of course on every campus, was significant of the belated but eventually emphatic acceptance of the new form of education. It was also while he was serving as dean of the Ohio College of Agriculture, and largely through his influence, that the first session of the Graduate School of Agriculture, fostered by the Association of American Agricultural Colleges and Experiment Stations, was held in 1902.

Dr. Hunt was long a familiar figure at the meetings of the association. He will he particularly remembered for his service on its committee on instruction in agriculture. The subject of methods of instruction was one in which he was much interested, and he was a vigorous champion of the movement to introduce courses more closely related to the farm and farm life than was the prevailing trend of the day. He was the author or co-author of numerous texts, one of which, Soils and Crops, was issued in 1896. Another early work in a little-cultivated field was his History of Agriculture and Rural Economics, which appeared in 1899.

While Dr. Hunt's reputation was largely as a teacher, administrative officer, and writer, he was a firm believer in the need of research in the advancement of agriculture and the development of agricultural instruction, and his periods of service as a station director in Pennsylvania and California were years of steady development and encouragement. He was quite successful even in the face of discouraging circumstances in drawing together a large group of research workers, many of them of national reputation, and in furthering their efforts by securing appropriations and otherwise affording opportunity and facilities for their work under favorable conditions.

Dr. Hunt was broadly interested in agriculture as a whole rather than in its localized or narrowly specialized forms. He was zealous in the upbuilding of the Society for the Promotion of Agricultural Science as a means to this end, serving as its president in 1907–1909. During the war he was selected as one of the members of the Agricultural Commission and sent abroad by the Federal Government, and in 1920–21 he served as resident delegate of the United States to the International Institute of Agriculture at Rome. Presumably because of this relationship he was given last December the decora-

tion of Cavalier of the Order of the Crown of Italy. This honor, it is said, he consistently refused to make public during his lifetime. However this may be, it is certain that many other evidences of the value of his unique services to the cause of agricultural education have long been apparent to observers of the last half century's progress. His death will be especially mourned in the many institutions for whose upbuilding he had so ardently labored.

So diverse were the five men and women here considered in heritage, environment, and choice of work that they could hardly have been expected to possess many relationships in common. Yet likenesses are not hard to find. All were broadly educated, with more than the usual command of the English language, and most of them were firm believers in the efficacy of the written word. All were earnest advocates of research and the thorough preparation of research workers. In a large sense, all were educators, though their contacts with the educational world differed widely.

More characteristic and more fundamental than any of these attributes, however, was their zeal for the betterment of mankind, a zeal so concrete and personal as to lead one and all into more or less unexpected paths for the promotion of the cause. With Dr. Hunt, the agronomist, the road ran quite directly into the domain of agricultural education and subsequently to explorations in the then little-known realm of agricultural economics and sociology. For Miss Hunt, also, the new science of home economics was a logical selection, but with her temperament and ideals it was inevitable that her work could not be limited to the affairs of the kitchen but would embrace the whole field of social philosophy. It was more than a coincidence, however, that the remainder of the group should have so applied their respective specialties of microbiology, phytochemistry, and phytopathology as to make substantial contributions to the knowledge of three serious human diseases—tuberculosis, leprosy, and cancer. Yet while Drs. Marshall, Power, and Smith in this work touched humanity at these points more directly, this phase was merely typical of the whole dominating motives of their lives. Likewise it was no accident that the services of the entire five were recognized repeatedly by associations of workers in their own and related fields, by foreign Governments, by great universities, and by scientific institutions. As a group their lives well exemplify the spirit of applied science, irrespective of its manifold divisions, of contributing the utmost possible service to the world.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The composition of milk, I, II, H. T. CRANFIELD, D. G. GRIFFITHS, and E. R. LING (*Jour. Agr. Sci. [England], 17 (1927), No. 1, pp. 62–93, figs. 13*).—Two series of analytical investigations are reported.

I. *Variation in the solids-not-fat, fat, and protein content of cow's milk, and their relationship.*—Over 700 mixed milks from 15 herds were examined during 1925–26 for percentages of fat, solids-not-fat, and protein. The herds were selected to include the greatest variation possible in size of herd, climate, soil types, and general management. The report inclndes frequency distributions, standard deviations, mean percentages with probable errors, and correlation tables and grapbs for the three constituents determined. Certain seasonal variations of some ratios are discussed.

II. *Variation in the percentage of mineral constituents in cow's milk, and their relationship with the solids-not-fat and protein content.*—Determinations were made of total ash, soluble ash, insoluble ash, lime, and phosphoric acid in 670 mixed milks from 15 herds. Frequency distributions, standard deviations, mean and probable error of mean are reported for each constituent named. Correlations of these constituents with solids-not-fat and with protein are shown in tables and curves. Total asb was found to fall with solids-not-fat until low values of the latter constitnent were reached, when the ash appeared to rise. Soluble ash rises, insoluble ash falls, with falling solids-not-fat; and lime and phosphoric acid fall with nonfatty solids. Seasonal variations were noted.

A study of the proteolytic action of certain specific organisms on milk proteins in milk and synthetic butter, G. SPITZER, E. H. PARFITT, and W. F. EPPLE (*Jour. Dairy Sci., 10 (1927), No. 1, pp. 15–32*).—In experiments reported from the Indiana Experiment Station, sterile skim milk samples were inoculated in pure culture with 13 species of microorganisms and incubated at from 20 to 21° C. Analyses were made each 15 days for ammonia, for nitrogen not precipitated by phosphotungstic acid, and for nitrogen not precipitated in a saturated solution of zinc sulfate. The synthetic butter experiments were made by sterilizing 50-gm. lots of skim milk, inoculating with the specific organism to be studied, and adding to each 100 gm. of sterilized butterfat, tbe mixtures being rendered homogeneous by shaking. Synthetic butters were held at room temperature and at from 0 to 4°. Analyses of these two series were made each 15 days and each 30 days, respectively.

In 45 days the various organisms produced ammonia increases in milk of from 0.06 to more than 25 per cent; the nitrogen not precipitated by phosphotungstic acid showed increases of from 0.18 to 50 per cent; and peptone increases were from 0.56 to nearly 21 per cent. In the butter experiments, after 120 days at 0 to 4°, the ammonia increases ranged from 0.17 to 1.16 per cent, the nonprecipitated nitrogen from 0.17 to 20.8 per cent, and the peptone from 1.72 to over 25 per cent. Held at room temperature for 60 days, the synthetic butters showed, with the various organisms, ammonia increases of from 0.50 to 2.14 per

cent, nonprecipitated nitrogen increases of from 6.15 to 18.75 per cent, and peptone increases of from 0.08 to 18.66 per cent.

The effect of heating on the hydrogen-ion concentration and on the titratable acidity of milk, E. O. WHITTIER and A. G. BENTON (*Jour. Dairy Sci.*, *9 (1926), No. 5, pp. 481–488, figs. 2*).—The effect on H-ion concentration and on the titratable acidity of milks produced by heating them continuously at 95 and at 100° C. for from 14 to 16 hours was studied. The H-ion concentration increases continuously after an initial drop attributed to loss of carbon dioxide from the milk. The titratable acidity rises somewhat more sharply than the H-ion concentration. During coagulation the rate of change of H-ion concentration is considerably lessened, due to buffer readjustments which can not yet be explained. At the same time there is apparently some adsorption of the acid by the curd. The amount of acid production is dependent upon both time and temperature of heating.

Variations in the susceptibility of the fat in dry whole milks to oxidation when stored at various temperatures and in various atmospheres, G. E. HOLM, P. A. WRIGHT, and G. R. GREENBANK (*Jour. Dairy Sci., 10 (1927), No. 1, pp. 33–40, figs. 4*).—Free acid catalyzes the oxidation of the fat. The initial change appears to be favored by certain enzymes which are largely removed by clarification. Results with dry whole milks of low and of relatively high moisture content indicate that free moisture has a retarding effect on oxidation, confirming the former observation of Greenbank and Holm (E. S. R., 52, p. 10). A small amount of free moisture is, therefore, necessary to optimum keeping quality. Since powders vary in water adsorption capacities, each powder would have its own optimum. For spray powders of good solubility an optimum moisture content of between 2 and 3 per cent has been found. Plots of induction period against time of storage are given to indicate the effect of storage time, storage temperature, and moisture content upon susceptibility to oxidation.

Results of preliminary experiments upon the effect of separating, or clarifying, and pasteurizing of a milk upon the keeping quality of its milk powder, G. E. HOLM, G. R. GREENBANK, and E. F. DEYSHER (*Jour. Dairy Sci., 9 (1926), No. 6, pp. 512–516, figs. 2*).—Preliminary results of a study in continuation of that previously noted (E. S. R., 54, p. 711) indicate that the keeping quality of whole milk powders can be materially improved by clarification of the milk, preferably as soon as possible after it is drawn. Higher pasteurization temperatures than are ordinarily used (63° C. for 30 minutes) also seem desirable, but too high a pasteurization temperature appears to render the fat more readily oxidizable. Plots of induction period against time of storage are given to show the effects of clarification and of varying temperatures of pasteurization on the resistance to oxidation of the fat of milks after drying.

Sweetened condensed milk, V, VI, F. E. RICE (*Jour. Dairy Sci., 9 (1926), Nos. 3, pp. 293–305; 5, pp. 459–468*).—In continuation of experiments previously noted (E. S. R., 55, p. 613), rancidity is defined in part 5 as a flavor resembling that of butyric acid. Rancid commercial condensed milks showed a high titratable acidity, increasing with the degree of rancidity. The viscosity also increased, some of the samples becoming solid. However, this is not to be confused with bacterial thickening (E. S. R., 51, p. 380). The peroxidase test was usually positive. Two general forms of experiment were used: (1) Small scale manufacture in an experimental vacuum pan; (2) addition of raw milk or other substances to factory-made condensed milks.

Rancidity is apparently due to a lipase contained in the raw milk. The admission of a little raw milk into the pan while a batch of milk was being condensed invariably caused rancidity. As little as 0.75 per cent of raw milk

added to normal condensed milk had the same effect. The lipase present in an addition of 0.2 per cent of commercial pancreatin was also effective. The lipatic activity of raw milk was destroyed by momentary heating to 150° F., but in the presence of 35 per cent of sucrose higher temperatures were required. The bacteria of the raw milks productive of rancidity, together with other bacteria and many molds, were tested for capacity to produce rancidity, with negative results. Excessive heat before or during the condensation, the use of neutralized sour milk, the freezing of the milk, the addition of oxidation and hydrolysis products of fat, and the addition of iron, copper, tin, zinc, and hypochlorous acid salts were all eliminated as causes of rancidity, and lipase appears to be the sole cause.

Factory control methods for preventing rancidity are suggested.

Tallowiness in condensed milk, taken up in part 6, results from an atmospheric oxidation in the container (usually catalyzed by small amounts of copper) of the butterfat of the milk. Iron is a much feebler catalyst in the reaction and is not of practical importance, and tin appears to be without effect. Tallowiness increases with the copper content, much more air space being necessary to produce the flavor when the copper content is low.

The time of holding the milk in open pasteurizers, holding tanks, and hot-wells should be as short as is practicable. Copper equipment should be eliminated wherever possible. Copper apparatus that has not been used for some time should be cleaned with especial care, since milk dissolves copper much more readily from an oxidized than from a bright copper surface. As little as 2.5 mg. of copper per kilogram of condensed milk, added as lactate, produced distinct tallowiness in 70 days in samples having some air space over the milk and held in cold storage. The addition of clean, bright copper strips had the same effect of distinct tallowiness in 70 days, fairly strong tallowiness in 100 days.

Peroxidase as a factor in butter deterioration, L. S. Palmer and M. M. Miller (*Jour. Dairy Sci., 9 (1926), No. 3, pp. 272–275*).—In experiments at the Minnesota Experiment Station, peroxidase concentrated from horse-radish roots according to the method of Willstätter was added to cream which had been rendered free from enzymes by heating to determine whether the presence of peroxidase is in itself detrimental to the keeping quality of butter. The butter made from the cream was packed in 1-pint glass jars having glass tops, rubber seals, and metal clamps. Aseptic conditions were maintained as far as possible throughout, all utensils, jars, etc., being sterilized. One-half of each lot of butter was stored at room temperature and the other half at 0° C. The examination included a study of the organic and amino acids in the aqueous phase of the butter, peroxidase tests on the aqueous phase of the butter, the Kreis test on the butterfat, and a determination of the amount of oxidized fatty acids in the fat. The general quality of the stored samples was also noted.

It was concluded that peroxidase in itself is not a factor in the deterioration of stored butter. The improved keeping quality of butter made from cream pasteurized at a high temperature appeared to be due to the elimination of deteriorative agencies other than peroxidase.

Lactose solubility and lactose crystal formation.—I, Lactose solubility, O. F. Hunziker and B. H. Nissen (*Jour. Dairy Sci., 9 (1926), No. 6, pp. 517–537*).—The colloids in milk do not appear to have any material influence on the solubility of lactose or the form of the lactose crystals. The presence of sucrose diminishes the solubility of lactose somewhat, this effect being very slight in sucrose solutions below 14 per cent, and affects the form of the crystals. Lactose solubility was determined by direct observation of the saturation

point, by determinations of total solids, and by gravimetric determinations according to Fehling's method with Munson and Walker's tables. Close agreement with Hudson[1] was obtained with respect to the solubility of lactose in water.

A biochemical study of the insoluble pectic substances in vegetables, C. M. CONRAD (*Amer. Jour. Bot., 13 (1926), No. 9, pp. 531–547, figs. 3*).—The nomenclature and definition of pectic substances is confused. The three insoluble pectic substances considered in this paper, from the Maryland Experiment Station, are designated protopectin, pectic acid, and insoluble pectates, pectin being defined, in accordance with Fellenberg's results,[2] as a more or less *methylated pectic acid, the solubility increasing with the number of carboxyl* groups methylated.

Carré's method[3] for protopectin in apples was studied with respect both to concentration of acid and to time and temperature of heating, for the purpose of adapting the method to various vegetable materials. Hydrochloric acid from N/30 to N/50, heated with the tissues for 1 hour, gave the best results. These conditions apply to vegetable materials containing only protopectin. The pectin resulting from this hydrolysis of protopectin was converted into calcium pectate and weighed according to the Carré and Haynes method (E. S. R., 47, p. 610). Difficulties in filtration due to starch, to proteins, and in onions to a substance apparently soluble in alcohol were encountered. Malt solutions and diastase could not be used for removing starch, as they destroyed the pectin, but ptyalin (saliva) was effective. In the case of potatoes, the protein was estimated by the Kjeldahl method and its weight deducted from that of calcium pectate precipitated.

Materials containing pectic acid as well as protopectin did not yield all their pectic substances when handled according to the above method. A combined method in which protopectin and pectic acid were determined together was, therefore, devised, the protopectin being hydrolyzed with N/30 hydrochloric acid as before, while the pectic acid was dissolved by adding ammonia citrate up to 1 per cent to the neutralized hydrolyzate and again boiling for 30 minutes. It was found that pectic acid may be formed in drying the samples. This was prevented by boiling the sliced material in 95 per cent alcohol and subsequently drying at 80° C.

Protopectin, pectin, and pectic acid were determined in a variety of plant tissues. The two former substances were found in all the tissues studied, but free pectic acid was found only in radishes.

The solidification point of food fats [trans. title], T. MEYER (*Ztschr. Untersuch. Lebensmtl., 52 (1926), No. 6, pp. 461–465, figs. 3*).—The solidification point determination is liable to error in that the solidification is often only a crystallization of an insoluble fat fraction from a still liquid portion, in which point the author confirms Rahn.[4] The drop and subsequent rise of the temperature is not comparable with that occurring in a freezing point determination and will only give consistent results if all the conditions of every determination are strictly the same. Good results were obtained with the fats of the margarine industry by Mohr's method. The greatest discrepancy found was ±0.2° C., the average being less than ±0.1°. The solidification curves of various fats are characteristic. Good margarines have solidification curves similar to those of butterfats.

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[1] Jour. Amer. Chem. Soc., 26 (1904), No. 9, pp. 1065–1082.

[2] Mitt. Lebensmtl. Untersuch. u. Hyg., Schweiz. Gsndhtsamt., 5 (1914), No. 4, pp. 225–256.

[3] *Biochem. Jour., 16 (1922), No. 5, pp. 704–712.*

[4] *Milchw. Forsch., 1 (1923), No. 1, pp. 15–20.*

The determination of sodium, potassium, and chlorine in foodstuffs, A. D. HUSBAND and W. GODDEN (*Analyst, 52 (1927), No. 611, pp. 72–75*).—Kramer's method for sodium and potassium in blood (E. S. R., 42, p. 506) was modified for the determination of sodium and potassium in foodstuffs to avoid the inclusion of magnesium and of phosphates in weighing the mixed potassium and sodium salts. The modified procedure was carried out as follows:

"A suitable quantity of the material is ashed at a low temperature, and the ash is twice extracted with hot N hydrochloric acid (about 100 cc. in all being used). The residue is washed with hot water, and the filtrate and washings are made up to 200 cc. Of this extract, 100 cc. are heated to boiling, and 5 cc. of a 10 per cent solution of barium chloride are added. The mixture is evaporated to about 25 cc., and then, while hot, made alkaline with strong ammonia and allowed to cool. When cold, the precipitate is filtered off and washed with 2 per cent ammonia. The filtrate and washings are evaporated just to dryness in a 250-cc. beaker. To it, when cold, 30 to 35 cc. of alcoholic ammonium carbonate solution are added, and the whole is vigorously stirred for about 5 minutes. The contents of the beaker are transferred to a 100-cc. flask and the beaker rinsed with more alcoholic ammonium carbonate solution. After thorough shaking, the solution is made up to the mark with the reagent. The mixture is allowed to stand at least 2 hours, preferably overnight, and then filtered into a dry flask. Fifty cc. of the filtrate are evaporated to dryness in a weighed vitreosil basin, and the cold residue treated with 5 cc. of redistilled sulfuric acid. The excess of acid is evaporated off on a sand bath, and the residue is heated over a naked flame until quite dry. During this stage it is advisable to scatter on to the residue a little powdered ammonium carbonate, which facilitates the removal of the last traces of sulfuric acid. The dish is then heated in the muffle at a bright red heat for 10 minutes, cooled, and weighed. From this weight of mixed sulfates and the percentage of potassium the percentage of sodium can be calculated."

The potassium may be satisfactorily determined volumetrically, by means of cobaltinitrite.

Chlorine is extremely likely to be lost in ashing the sample. Treating the sample with from 10 to 25 per cent of its weight of calcium oxide, mixing to a paste with water, and ashing the mixture at a low temperature greatly reduces the loss. The Official method gave very low results. These findings confirm those of Weitzel (E. S. R., 46, p. 311).

Testing wheat for protein with a recommended method for making the test, D. A. COLEMAN, H. C. FELLOWS, and H. B. DIXON (*U. S. Dept. Agr. Bul. 1460 (1926), pp. 32, figs. 3*).—The growing importance of crude protein in the valuation of wheat is noted. At present hard red spring and hard red winter wheats are marketed on a protein basis.

Current methods for the protein test were subjected to collaborative study at experimental, mill, commercial, and grain testing laboratories in the central Northwest and Southwest. A minimum difference between duplicates of 0.58 per cent was found, the maximum difference being 1.22 per cent. An exhaustive laboratory study was made of many of the outstanding methods. A direction for a standard method is given, including detailed notes on sampling, removing dockage, dividing and grinding the sample, preparing reagents, and selecting apparatus, digesting, and distilling.

Great care is needed to prevent loss of moisture from samples. Not less than 30 gm. should be ground. The Gunning method is as economical as any if optimum heat conditions are provided, but the Kjeldahl is the only method by which wheat samples are completely oxidized in less than an hour at all intensi-

ties of heat tested. Yellow and red oxides of mercury are equivalent, 0.5 gm. giving best results; mercuric sulfate gives slightly lower results. Copper sulfate is of little value at low intensities of heat. Ten gm. of either sodium or potassium sulfate gave satisfactory results with 20 cc. of sulfuric acid. The caking of sodium sulfate can be prevented by using 60 per cent potassium sulfate with 40 per cent sodium sulfate. Electric heat is to be preferred. The slightly higher results obtained with 2 gm. samples do not warrant the extra digestion time required. Traps and blank determinations are important. At least 150 cc. of distillate should be collected in acid capable of holding the ammonia equivalent to from 35 to 70 mg. of nitrogen for samples of from 1 to 2 gm. Sulfuric and hydrochloric acids are equally good for receiving the ammonia. Contrary to some statements in the literature, boric acid solution does not hold ammonia quantitatively at temperatures of 40° C. and above.

The examination of mixtures of coconut oil and palm kernel oil.—The determination of butter fat in margarine, C. D. ELSDON and P. SMITH (*Analyst, 52 (1927), No. 611, pp. 63–66*).—Tables for determining butterfat in margarines from the Polenske and the Kirschner values and for calculating coconut and palm kernel oils from the Reichert and Polenske values are given.

A comment by H. D. Richmond on the limitations of the method indicates that when coconut oil and palm kernel oil "exist in the same mixture and the percentage of coconut oil is well under 50 per cent, an approximate idea of the relative proportions of the two oils can be deduced within about 15 or 20 per cent either way."

A rapid method for the sorting of butters and margarines, C. H. MANLEY (*Analyst, 52 (1927), No. 611, pp. 67–72, figs. 2*).—The following procedure is substituted for the Reichert method:

"Five gm. of the filtered fat are saponified with 20 cc. of glycerol soda solution (made by mixing 900 cc. of pure glycerol with 100 cc. of a 50 per cent aqueous solution of sodium hydroxide) and the soap dissolved in 100 cc. of boiled distilled water. Into the cooled solution 4 drops of 0.5 per cent methyl orange solution are introduced and sulfuric acid (25 per cent by volume) added from a burette until the solution is faintly pink. The total volume of the solution and precipitated fatty acids is taken and 100 cc. filtered off, nearly neutralized with 10 per cent sodium hydroxide solution, and the neutralization completed with N/10 sodium hydroxide solution. In this way the sulfuric acid is neutralized, leaving only the soluble fatty acid, which is then titrated with N/10 sodium hydroxide, after the addition of 0.5 cc. of 0.5 per cent phenolphthalein solution. The number of cubic centimeters of N/10 sodium hydroxide solution taken, less the number required for a blank, is represented as the M value.

"The blank is carried out upon 20 cc. of glycerol soda solution dissolved in 100 cc. of distilled water (free from carbon dioxide). In measuring the glycerol soda solution, 20 cc. are poured into a 25-cc. cylinder, and after the bulk has been transferred to the flask, 4 drops are allowed to enter, after which the cylinder is removed. In this way a reasonably uniform quantity is used in each case."

The neutral filtrate may be used for a determination of the Kirschner value. The method can not claim the accuracy of the Polenske process, but it can be used advantageously for margarines, in which the probability of a butterfat content in excess of 10 per cent is extremely small. The presence of boric acid was not found to interfere.

A Babcock-Gerber method for determining the percentage of fat in ice cream, H. C. MOORE and P. A. MORSE (*Jour. Dairy Sci., 9 (1926), No. 3, pp.*

276–285).—Using Babcock test bottles, the Troy-Fucoma modification of the Gerber method for butterfat was compared experimentally with the Mojonnier and the Troy-Fucoma methods, and found to be quicker, simpler, and more accurate than the Troy-Fucoma method. It is recommended for factory control, but for more accurate work the Mojonnier method is preferred. A slight modification of the method of Fisher and Walts (E. S. R., 53, p. 809) was found superior to the Troy-Fucoma method in accuracy.

METEOROLOGY

Popular long-range weather forecasts, C. J. P. Cave (*Nature* [*London*], *119* (*1927*), *No. 2984, pp. 52–55, figs. 3*).—The 50-day rainfall forecasts prepared by Lord Dunboyne and published in the London *Daily Mail* are discussed and certain tests of their reliability are applied, from which it is concluded that "the forecasts, even for one week ahead, have not any success" and are no better than "purely fortuitous predictions." It is stated that no account of the methods used in preparing the forecasts has been published.

Popular long-range weather forecasts, R. P. Butler and C. J. P. Cave (*Nature* [*London*], *119* (*1927*), *No. 2987, pp. 164–167, figs. 2*).—The question of accuracy of the forecasts referred to above is further discussed.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. Ostrander and W. H. Parkin (*Massachusetts Sta. Met. Buls. 457–458* (*1927*), *pp. 4 each*).—The usual summaries and notes are given of observations at Amherst, Mass., during January and February, 1927.

Oklahoma climagraphs and biotic regions, A. O. Weese (*Okla. Acad. Sci. Proc.* [*Okla. Univ.*], *5* (*1925*), *pp. 91–95, figs. 3*).—Climagraphs, or more accurately, as the author claims, hythergraphs, portraying graphically the climatic rhythm to which the biota of a given region is adjusted, were made "for all Weather Bureau stations in the State for which records covering 15 years or more were available," and an attempt is made "to divide the area into climatic regions as indicated by the climagraph types." There was found to be a close agreement between the map so constructed and the various vegetation maps which have been published. It is suggested that "further studies should take into account not only averages but critical years, which have a very great influence in delimiting the distribution of species at or near the borders of their range."

A preliminary division of Oklahoma into major and minor provinces on the basis of rainfall adequacy, C. J. Bollinger (*Okla. Acad. Sci. Proc.* [*Okla. Univ.*], *5* (*1925*), *pp. 119–123, fig. 1*).—The paramount importance of rainfall in Oklahoma agriculture is indicated, other climatic elements being generally favorable but failing of full efficiency "because there is not a corresponding abundance of soil moisture to meet the requirements of growing plants." On the basis of rainfall during the 10 years 1911–1920, the State is divided into three major divisions as regards rainfall, namely, humid, semihumid, and semiarid. These major divisions, "based on the frequency of occurrence of months between February and November with an amount of rainfall which it is believed will give adequate moisture for the average crop growing on the average soil," are subdivided into "districts based on the percentages of months rated 'adequate' during spring and early summer, March to June, inclusive, which is, with the possible exception of the 'Panhandle,' the chief period of crop growth in Oklahoma." The percentages of months having adequate rainfall during the 10-year period were, for the different districts, as follows: Humid, 62.5; semihumid, 37.5 to 62.5; semiarid, less than 37.5.

Aerological code, 1926 (*U. S. Dept. Agr., Weather Bur., 1926, pp. 22, fig. 1*).—This is the revised code for transmission of free-air observations, effective January 1, 1927.

SOILS—FERTILIZERS

Soil characteristics: A field and laboratory guide, P. Emerson (*New York and London: McGraw-Hill Book Co., 1925, pp. X+222, pls. 2, figs. 5*).—This manual contains chapters on a general study of soils, soil physics, soil fertility, and soil microbiology.

A study of soil types in relation to utilization and management, W. W. Weir (*Jour. Amer. Soc. Agron., 18 (1926), No. 12, pp. 1067–1075, fig. 1*).—In a contribution from the U. S. D. A. Bureau of Soils the results of a field survey covering six counties in north-central Indiana are reported. This survey was made for the primary purpose of studying the relation of soil types to crop production.

The facts collected showed that when the dominant soils within the area surveyed are classified according to the natural characteristics observed within their profiles, such soils correspond to the soils to which the farmers have given recognition (1) in local descriptive names, (2) in their soil management practices, (3) in their estimates of average yields per acre, and (4) in their estimates of relative land values as based on their farming experiences.

Soil survey of Greene County, Alabama, J. F. Stroud et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1923, pp. III+357–399, fig. 1, map 1*).—This survey, made in cooperation with the Alabama Department of Agriculture and Industries, deals with an area of 412,800 acres situated in western Alabama and included in the geological division of the Gulf Coastal Plain. The elevation is from 100 to 400 ft. above sea level. The surface features consist of flat stream bottoms and terraces, undulating prairie, and gently rolling to hilly land in the northern part. Upland drainage is good, but that of the stream bottoms is poor.

The two main soil groups noted are prairies or limestone lands, especially adapted to alfalfa, grasses, and clovers, and rolling uplands with light sandy surface soils over reddish yellow to red subsoils, principally utilized for cotton, trucking, and fruit growing. The calcareous first and second bottom soils are suited to grasses and corn and are among the most productive soils of the county. The areas under the various soils are classified into 4 types in 14 series, the Ruston and Cahaba fine sandy loams leading in proportionate area covered, with 15.1 and 8.3 per cent, respectively. Fine sandy loams constitute the most frequently represented soil type found in the survey.

Soil survey of Gibson County, Indiana, T. M. Bushnell et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. IV+1159–1216, pl. 1, figs. 2, map 1*).—This report is presented in two parts:

I. [*Soil survey*], T. M. Bushnell and W. E. Tharp (pp. 1159–1201).—A survey made in cooperation with the Indiana Experiment Station, of an area of 316,800 acres of the "Wabash Lowland Region," in the southwest corner of Indiana is described. About one-fourth of the area is bottom land, with a smaller proportion of glacial-lake and outwash plains, the remainder consisting of gently to steeply rolling, well-drained uplands, from 400 to 650 ft. above sea level. The bottoms are somewhat subject to overflow and are poorly drained.

The soils may be grouped according to conditions of development as (1) well drained, (2) water saturated, (3) alternately saturated and aerated, and (4) alluvial. Areas of 7 soil types in 24 series are tabulated and mapped, the largest areas being those of Gibson and Tilsit silt loams, which constitute 16.9 and 11.8 per cent, respectively, of the total area surveyed.

II. *The management of Gibson County soils*, A. T. Wiancko and S. D. Conner (pp. 1203–1216).—The soils of the county are grouped according to their needs as indicated by chemical composition, physical properties, and drainage conditions, with indications as to proper treatment of the soils of each of the groups.

Soil survey of Coleman County, Texas, H. W. Hawker et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+1217–1256, fig. 1, map 1*).—This survey, made in cooperation with the Texas Experiment Station, deals with an area of about 800,000 acres situated at about the geographic center of the State. The original upland, undoubtedly nearly level with a slight east and southeast slope, has been largely removed by erosion. The present surface consists of a series of low ridges and plateau-like areas, with broad terraces and valleys. The average surface level of both terraces and uplands rises toward the west and northwest. The elevation varies from 1,400 to 2,250 ft. above sea level. The mean annual rainfall is 27.8 in.

The soils are of 3 main classes: Residual, outwash or terrace plain, and recent alluvial or first bottom soils. Silty clay loam, clay loam, and clay soils predominate. Including rough stony land, 6 types of 10 series are mapped, of which Abilene clay and Valera stony clay cover, respectively, 42.8 and 27.4 per cent of the area. The Abilene soils are productive, and, with a rainfall well distributed during the growing season, give good yields of crops adapted to the region.

Minnesota glacial soil studies, II, III (*Soil Sci., 23 (1927), No. 1, pp. 57–80, figs. 6*).—Two further contributions from the University of Minnesota are presented (E. S. R., 45, p. 19).

II. *The forest floor on the late Wisconsin drift*, F. J. Alway and P. M. Harmer.—The forest floor was sampled in 9 virgin or nearly virgin Minnesota woods, 6 being remnants of the original southeastern deciduous forest and 3 being in the northern coniferous forest.

The weight per acre was found to vary from 13 to 97 tons and the content of nitrogen from 1.47 to 1.89 per cent and of volatile matter from 52 to 81 per cent. The nitrogen in the volatile matter varied from 2.02 to 2.99 per cent, the organic carbon from 31 to 39 per cent, and the ratio of organic carbon to nitrogen from 18 to 24 per cent. The samples showed little or no acidity, carried about 0.3 per cent phosphoric acid, and had moisture equivalents of from 97 to 120.

A comparison of the weight per acre of nitrogen in the forest floor with that in the underlying 6 in. of soil showed the one extreme to be in a hard maple wood, in which the floor carried only one-sixth as much as the surface soil, and the other in a spruce-balsam-birch forest, in which the floor carried more than three times as much nitrogen as the surface 6 in. of soil.

III. *Density of the surface foot in forest and prairie on the late Wisconsin drift*, P. M. Harmer.—The density of the soil in place was determined in the four 3-in. sections of the surface foot of 12 Minnesota virgin fields developed on the till plains of the Des Moines lobe of the late Wisconsin drift. Six of these fields were in the deciduous forest and 6 on the open prairie. In the surface section the density of the soil was much the same in prairie and forest, but below that it increased gradually in the former and rapidly in the latter, being one-third higher in the lower two sections of the forest soil.

On the permeability of clay soils, J. Wityn (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 4 (1926), No. 3, pp. 554–588, figs. 17*).—Studies conducted at the Department of Agriculture in Latvia are reported.

Great fluctuations were observed in the permeability of soils, and the mechanical composition of the soil was found to offer only a small clue. The

fluctuations were greater in sandy soils than in loam and clay soils, and greater in the loam soils as the content of fine particles not capable of sedimentation in three weeks increased. Permeability fluctuations were small in those soils which contained few particles of this size.

The permeability of marl loam soil was considerably reduced by distilled water, and acid soils and neutral humus were made completely impermeable after a few months. Soils were more permeable to water containing carbon dioxide, and the permeability of marl loam was considerably increased. The effect was not so noticeable in acid soils.

The permeability of soils for a 0.02 N solution of calcium bicarbonate was quite different from the permeability for water saturated with carbon dioxide. This solution passed through marl loam quite readily if it contained no podsol formations. It did not pass readily through acid podsol soil but passed through the subsoil of the podsol. Large differences in the permeability for this solution were also observed in the clay loams, and this was very greatly influenced by the absorbed sodium content of the soil. The permeability of clay loam with a high content of absorbed sodium was very small for the bicarbonate solution, but there was an improvement on partial removal of the sodium content.

The permeability of soils for gypsum was similar to that for calcium bicarbonate except in the case of marl loam containing podsol and clay loam containing considerable quantities of absorbed sodium. Solutions containing both calcium sulfate and calcium bicarbonate increased the permeability of very acid clay loam soil.

The permeability of neutral soils was considerably increased by calcium hydroxide, and the effect of this treatment remained for several months. The permeability of very acid soils was quickly reduced by this treatment, which was followed in a short time by almost complete impermeability. Sodium bicarbonate solution even in very weak concentrations considerably reduced the permeability of soils, and if the soils contained no calcium carbonate the finest constituents were leached out to a considerable extent. The influence of sodium bicarbonate was found to be greatest in clay soils, even in the lowest concentration used.

Even very dilute solutions of ammonia decreased the permeability of soils, especially marl loams and clays. The degree of dispersion of marl loams was increased by very dilute ammonia solutions, and the decomposition of the calcium carbonate content was reduced.

Treatise on sedimentation, W. H. TWENHOFEL (*Baltimore: Williams & Wilkins Co., 1926, pp. XXV+661, pls. 38, figs. 14*).—This book contains chapters on sources and production of sediments; the transportation, deposition, diagenesis, and lithification of sediments; important conditions modifying sedimentary processes; sediments and organisms; products of sedimentation; structures, textures, and colors of sediments; environments or realms of sedimentation; and field and laboratory studies of sediments.

Aluminum hydroxide and the "freezing up" of alkali soils during reclamation, W. T. MCGEORGE, J. F. BREAZEALE, and P. S. BURGESS (*Science, 64 (1926), No. 1664, pp. 504, 505*).—In a contribution from the Arizona Experiment Station it is reported that the so-called freezing up phenomenon of alkali soils during the reclamation process is due to the precipitation of colloidal aluminum hydroxide within the washed soil complex simultaneously with the almost complete dispersion of the clay fraction, as the alkalinity is progressively reduced below pH 9.5 to 10. Where black alkali soils are being reclaimed by leaching the freezing up occurs as soon as the excessive alkalinity is reduced to the precipitation point of aluminum hydroxide.

It has been found that if pure aluminum hydroxide is allowed to become perfectly dry it loses many of its colloidal properties, which can not be fully restored by wetting or by pulverizing. It was shown that if a black alkali soil is leached with pure water until it becomes impermeable and is then dried out and cultivated, it takes water much more readily.

A contribution to the study of interrelations between the temperature of the soil and of the atmosphere and a new type of thermometer for such study, A. Smith (*Soil Sci., 22 (1926), No. 6, pp. 447–457, figs. 3*).—In studies conducted at the University of Wisconsin air temperatures taken at heights varying from 6 to 60 in. above the soil surface were higher during the day in cropped areas, such as sugar beets and corn, than in uncropped areas. With a crop such as hemp, where there was a heavy stand, lower temperatures were obtained during the day at the 6- and 12-in. heights and higher temperatures at the 36- and 60-in. heights, as compared with adjoining uncropped areas. The night air temperatures taken immediately preceding sunrise, when the atmosphere was calm, were higher in the cropped than in the uncropped areas. The greatest differences were found in the hemp. Inversions of temperature were greatest over the uncropped plats.

By the use of an enlarged bulb thermometer the temperature of the surface soil was found to be lower than that of the air in contact with it just before sunrise on calm nights. Mineral soils where the drainage conditions were good showed differences as high as 4.55°, whereas on poorly drained areas, such as peat soils, the temperature of the surface was seldom more than 1.5° cooler than the air in contact with it. During calm weather the temperature of the air in contact with the soil was found to be higher by the use of the copper bulb as well as by the electric resistance thermometer.

On the origin and nature of the soil organic matter or soil "humus"—V, The rôle of microörganisms in the formation of "humus" in the soil, S. A. Waksman (*Soil Sci., 22 (1926), No. 6, pp. 421–436*).—This is the fifth contribution to the subject by the New Jersey Experiment Stations (E. S. R., 56, p. 421).

It was found that by the use of dilute sodium hydroxide the soil organic matter can be separated into four distinct groups (1) the part insoluble in dilute alkali even under pressure, (2) the part soluble in alkali and precipitated by an excess of hot hydrochloric acid, (3) the part soluble in alkali and in acid but precipitated at a definite isoelectric point, namely, at pH 4.8 to 5, and (4) the part made soluble in water as a result of treatment of the soil with alkali. The third fraction may be absent in peat soils but it is present abundantly in mineral soils, consisting of from 50 to 70 per cent of aluminum and other bases and from 25 to 40 per cent of organic matter. The presence and absence of this fraction allows a differentiation between peat and mineral soils. The second fraction, equivalent to the so-called humic acids, is practically free from ash and contains from 2 to 4 per cent of nitrogen.

When organic matter is added to the soil the various sugars, starches, hemicelluloses, celluloses, and proteins are rapidly decomposed. The lignins, and to a lesser extent the fats and waxes, resist decomposition under anaerobic conditions, as in peat soils, and are slowly decomposed under aerobic conditions by certain groups of organisms.

Pure or mixed cultures of soil fungi and bacteria rapidly attack the various constituents of the natural organic materials added to the soil, converting a part of the carbon into microbial protoplasm. A definite amount of nitrogen is thereby assimilated and changed from an inorganic into an organic form or from plant proteins into microbial protoplasm. A part of this protoplasm gives all the reactions characteristic of humus and is rather rich in nitrogen.

The soil humus is a result of the accumulation of substances of plant origin, on the one hand, largely the lignins and to some extent the fats and waxes and perhaps certain nitrogenous substances, and on the other hand nitrogenous substances synthesized by microorganisms.

On the degree of humification of the dead covering of forest soils, A. Nemec (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 4 (1926), No. 3, pp. 600–603*).—Studies conducted by the Ministry of Agriculture of Czechoslovakia are briefly reported which showed that the proportion of humified matter contained in organic matter increases in the humus of spruce, Scots pine, and pedunculate oak, with decreasing acidity of the vegetable mold. The strongly acid layers of the dead covering under close growing conifers and pedunculate oak produced practically no nitric nitrogen. The layers of humus in broad leafed forests were found to show generally a very considerable degree of humification and a high intensity of nitrification. The acid humus of conifers exposed to the action of sunlight was more easily rendered soluble than that in the dense shade of standing trees. In high forests of Scots pine the favorable influence of the beech undergrowth was indicated by the greater degree of humification of the superficial layer of humus.

The function of organic matter in the soil, C. E. Thorne (*Jour. Amer. Soc. Agron., 18 (1926), No. 9, pp. 767–793*).—In a contribution from the Ohio Experiment Station data from a large number of sources bearing on the subject are summarized.

Nitrate production under field conditions in soils of central Alberta, F. A. Wyatt, A. S. Ward, and J. D. Newton (*Sci. Agr., 7 (1926), No. 1, pp. 1–24, figs. 7*).—The studies indicate that the climate of the black earth belt of Alberta has been largely responsible for the fertile condition of the virgin soils as indicated by their nitrate content. It has been found that the soil temperatures from May to September, inclusive, are never too high to inhibit nitrification and are seldom sufficiently low to retard this process. The soils of this district as well as those of the prairie belt of Alberta are said to be also well supplied with microorganisms.

The analytical data showed that the soils contain an abundance of mineral nutrients and a comparatively large amount of organic matter. It is considered apparent that nitrification proceeds relatively rapidly in these virgin soils under field conditions.

The results obtained also confirm those of others in showing that the production of nitrates in field soils is influenced by the crop growing, the crop sequence, the method of tillage, and the moisture and temperature factors. It was found, for instance, that the perennial crops such as timothy and alfalfa keep the nitrates at a lower level than do the annual crops such as wheat, barley, corn, and potatoes. The nontilled annual crops such as wheat and barley keep the nitrates slightly lower than the intertilled crops such as corn and potatoes. It was found further that the plant residues from legumes promoted nitrification more vigorously and at an earlier date in these soils than did residues from nonlegumes.

A distinct relationship was established between the moisture and nitrate contents of the soil especially during the early part of the summer and until the rapid rate of plant growth disturbed this relationship. In the case of summer fallow this relationship persists later into the season than when the soil is cropped, and becomes disturbed only when the soil moisture becomes sufficiently great to leach some of the nitrates into the lower layers of the soil. In general the nitrate production was found to show a slight lag behind moisture and temperature. There is a major maximum in the nitrate production during the

latter part of spring and the early part of summer, and a minor maximum during the early part of the fall. However, when crops are occupying the soil the high point in nitrate accumulation seldom extends into the summer season.

It was found that in general the soil temperatures are inversely proportional to the soil moisture. There is a great accumulation of nitrates in fallow soil and a great disappearance when fallow soil supports a crop. Soils cropped continuously were found capable of producing sufficient nitrate nitrogen for the production of maximum crop yields.

Experiments in handling sweet clover with reference to the accumulation and conservation of nitrates in the soil, A. L. Whiting and T. E. Richmond (*Illinois Sta. Bul. 285 (1927), pp. 287–307*).—An account of experiments to determine the optimum time and conditions for the plowing under of sweet clover with reference to the nitrification and the physical condition of the soil and to the conservation of the nitrate produced is presented.

Nitrification was found to be rapid with both fall- and spring-plowed clover, the accumulation of nitrate being in one case in excess of the requirements of a large corn crop. Spring plowing resulted in a better physical condition of the soil than did fall plowing, however, and less labor was needed in the preparation of the land for subsequent crops. Moreover, a greater proportion of active organic matter was plowed under in the spring plowing. Summer-plowed sweet clover nitrifies rapidly and with a large accumulation, but subsequent losses of nitrogen are large unless a cover crop is planted. Both oats and rye proved effective as cover crops, oats being the more so on account of a greater fall growth and because this crop was dry when plowed in. There is no advantage with respect to nitrate production in the summer plowing, and it wastes a year. The date of spring plowing under is to be decided by the nature of the soil, light, sandy, open soils and those deficient in organic matter benefiting by as late a plowing as is consistent with a proper preparation for corn, whereas clays and loams, and soils in general which have grown one or more sweet clover crops, are not likely to be much affected with respect to corn production by the date of the spring plowing of the clover.

Under certain conditions nitrates appear to rise from the lower into the surface layers, the surface soil nitrate content increasing under surface soil moisture conditions which would inhibit nitrification. Even in the presence of a 50- to 65-bu. corn crop at its period of heavy nitrate absorption, the surface soil was frequently found to contain over 100 lbs. of nitrate nitrogen. Such a concentration should be converted into a fixed form for conservation. Weeds in the corn, volunteer grains, and late summer and fall crop growth serve to convert much nitrate. A legume will lead to more rapid nitrification in the following year.

In general, the investigations showed that sweet clover was effective in conserving soil nitrogen, and that the method of handling it plays an important part in the securing of its fertility value.

Crop rotations and soil management for eastern Canada, E. S. Hopkins and W. C. Hopper (*Canada Dept. Agr. Bul. 72, n. ser. (1926), pp. 57, figs. 19*).—A large amount of practical information on the subject is presented.

The effect of lime and fertilisers on the potash content of soil and crop, J. G. Lipman, A. W. Blair, and A. L. Prince (*Internatl. Rev. Sci. and Pract. Agr.* [*Rome*], *n. ser., 4 (1926), No. 3, pp. 546–553*).—Studies conducted at the New Jersey Experiment Stations are reported in which the potash content was determined in soils from a number of plats which had received definite fertilizer and lime treatment for a period of 15 years. It was also determined in several crops grown on the experimental plats.

The percentage of potash in the soil of plats having parallel fertilizer treatment was slightly lower in nearly all cases for the limed than for the unlimed sections. The fertilizer treatment did not appear to have had much influence on the potash content of the soil. Such variations as were noted were attributed mainly to natural variations in the soil or to limitations in the methods of sampling. There was a consistently lower percentage of potash in the cornstalks grown on the limed than on the unlimed sections.

Lime and phosphate, S. WATERMAN and N. J. THOMAS (*Ontario Dept. Agr. Bul. 321 (1926), pp. 20, figs. 5*).—The practical results of experiments on the effect of lime and phosphate on the yield of fall wheat and clover in Ontario are presented.

Soil investigations, A. N. HUME (*South Dakota Sta. Rpt. 1926, pp. 11, 12*).—Field experiments at Brookings show the possibility of increasing cereal crops by an average of 30 per cent through the use of phosphatic fertilizers. Similar indications were obtained in briefer field trials at Vermilion, Groton, and Highmore.

Summary of experiment station field plot tests comparing sulphate of ammonia and nitrate of soda as fertilizers (*Barrett Co. [New York] Agr. Dept. [Pub.] 33, [n. ser.], [1925], pp. 64*).—The results of a large number of experiments that have been conducted by the various agricultural colleges and experiment stations and by the U. S. Department of Agriculture comparing ammonium sulfate and sodium nitrate as nitrogenous fertilizers are summarized. While most of these experiments have included experiments with other fertilizer ingredients, it is apparently the intention of this publication to present the data comparing the two nitrogen carriers mentioned as the ones most important to the fertilizer trade.

The fixation of atmospheric nitrogen, J. M. BRAHAM (*Amer. Electrochem. Soc. Trans., 48 (1925), pp. 205–219, figs. 4*).—In a contribution from the U. S. D. A. Fixed Nitrogen Research Laboratory the growth and present trend in nitrogen fixation are discussed, together with some of the newer developments in the industry and the kind of nitrogen products being made available to agriculture from air nitrogen processes.

Three processes are now producing nitrogen compounds for fertilizer use. The synthetic ammonia process is considered to be the most important at present, and is used for over two-thirds of the total nitrogen fixed. The process is dependent upon a large supply of cheap hydrogen, and the catalyst is a very important factor. The arc process is dependent upon large quantities of cheap electrical power, and produces only 6.4 per cent of the total nitrogen fixed.

Some phenomena in the electric arc process of nitrogen fixation, S. KARRER (*Amer. Electrochem. Soc. Trans., 48 (1925), pp. 223–230*).—In a contribution from the U. S. D. A. Fixed Nitrogen Research Laboratory a discussion is given of the phenomena of dissociation of oxygen and nitrogen molecules into neutral atoms, ionization within the arc, excitation, radiation, and energy transfer.

The fixation of nitrogen as aluminum nitride, H. J. KRASE, J. G. THOMPSON, and J. Y. YEE (*Indus. and Engin. Chem., 18 (1926), No. 12, pp. 1287–1290*).—In a contribution from the U. S. D. A. Fixed Nitrogen Research Laboratory the history of the aluminum nitride process is briefly reviewed. Experiments on the reduction of low-grade bauxite in the electric furnace are reported to have given sufficiently encouraging results to warrant further investigation with larger equipment.

Nitrification experiments on the ferro-aluminum alloys showed that practically all the aluminum in the alloys could be nitrified if small amounts of such substances as cryolite, magnesium, aluminum, calcium fluoride, or chloride were added to the pulverized alloy before nitrification.

Since in the process approximately 4 lbs. of aluminum oxide are produced for each pound of nitrogen fixed, it was found that the value of the aluminum oxide is nearly twice that of the nitrogen. Hence it is considered evident that the process is primarily one for the production of alumina and not a nitrogen fixation process.

The assimilation of phosphorus from phytin by oats, A. L. WHITING and A. F. HECK (*Soil Sci., 22 (1926), No. 6, pp. 477–493, figs. 5*).—Studies conducted at the University of Illinois are reported which showed that the phosphorus supplied in phytin was more readily assimilated by growing plants than that in the inorganic form. An increase in the rate of application increased the phosphorus content of both the grain and straw of oats but to a greater extent of the straw. This was true with both organic and inorganic phosphates. A marked toleration of phosphorus was found in the straw of the oats and an indication of some tolerance of that element in the grain. Large amounts of phosphorus as phytin were found to be deleterious to the growing plant. Oats planted 23 days after the addition of alfalfa and leached alfalfa to sand were injured or killed, whereas those planted 14 days later in the same treatments grew normally.

Availability of Tennessee raw rock phosphate in relation to fineness and other factors, S. D. CONNER and J. E. ADAMS (*Jour. Amer. Soc. Agron., 18 (1926), No. 12, pp. 1103–1107*).—Studies conducted at the Indiana Experiment Station are reported in which commercial fine ground raw Tennessee phosphate was compared in pot cultures with the same material reground in a ball mill. The reground phosphate was only 7.7 per cent more effective than the commercial phosphate. The finest mechanical separate in the phosphate was 10 per cent more effective than the commercial phosphate. The pot tests with two soils deficient in phosphorus did not indicate that it would pay to grind such phosphate finer for use as a fertilizer in the raw form. The addition of sulfur to the raw phosphate caused an increase on one soil and a decrease on the other. Calcium carbonate reduced the availability of the raw phosphate on both soils.

The development of volatilization methods for the manufacture of phosphoric acid, K. D. JACOB (*Amer. Electrochem. Soc. Trans., 48 (1925), pp. 277–285*).—In a contribution from the U. S. D. A. Bureau of Soils a brief discussion is given of work by the bureau on the development of volatilization methods for the manufacture of phosphoric acid. A recent modification of the process consists in the substitution of an oil-fired furnace in the place of the electric furnace. While it is difficult to attain a temperature of 1,600° C. in fuel-fired furnaces, recent tests have shown that the phosphate rock-coke-silica mixture will react at as low a temperature as 1,200°.

Lime in agriculture, F. E. CORRIE (*London: Chapman & Hall, 1926, pp. IX+100*).—This is a practical handbook containing information on the use of lime in plant and animal nutrition.

Some effects of limestone and hydrated lime on biochemical activities in acid soils, H. DORSEY (*Connecticut Storrs Sta. Bul. 141 (1926), pp. 113–163, figs. 7*).—The experiments reported in part 1 of this bulletin (pp. 118–148) report comparative results with the Jones, Iowa, Truog, and Soiltex lime requirement tests, together with the colorimetric determination of the H-ions as applied at various regular intervals after the laboratory treatment of four

acid soils with equivalent quantities of ground limestone and hydrated lime. Part 2 (pp. 149–154) describes a brief study of the effect of the limes used upon the ammonifying and upon the nitrifying powers of the soils. In part 3 (pp. 155–162) the effect of field applications of the two limes is shown, together with comparative notes on the field and laboratory results.

Hydrated lime was found more effective in neutralizing soil acidity than ground limestone, but the difference lessened progressively after treatment. The effectiveness of ground limestone is also dependent both upon the degree of fineness and upon the base content. It reduced acidity gradually for from 6 to 8 weeks, the acidity rising a little in some cases at the end of about 6 or 7 weeks. With hydrated lime minimum soil acidity was reached rapidly, the acidity rising gradually after about from 2 to 3 weeks for a period of 8 weeks. Treated and untreated soils showed fluctuations in acidity during an 8-week period, though the treated-soil fluctuations were on a lower plane of acidity.

Both the ammonifying power and the nitrifying power of acid soils were increased by either limestone or hydrated lime.

Of the tests used in determining the lime requirements, the Jones test was found the most valuable because the most sensitive to small changes in lime requirements. The Truog and Iowa tests lack sharpness of color change for small variations in soil acidity. The pH determination correlated rather well with the Jones test. Changes caused in field soils by lime, limestone, and hydrated lime can be measured by any of the tests tried, but most accurately by the Jones test and by the pH determination. The temperature of the water used greatly influences the resultant indication of limestone requirement in the Jones test, and should be standardized.

Synthetic calcium silicates as a source of agricultural lime.—III, A comparison of the influence of synthetic calcium silicates with other forms of lime on the soil reaction, R. M. BARNETTE (*Soil Sci., 22 (1926), No. 6, pp. 459–466, figs. 3*).—A third contribution to the subject from the New Jersey Experiment Stations is presented (E. S. R., 56, p. 215).

Chemically equivalent and practical appplications of calcium carbonate, hydrated lime, dicalcium silicate, and limosil, which is a mixture of monocalcium silicate and calcium oxide, produced, within the limits of experimental error, equal changes in the H-ion concentration of soil to which they were added. There was a progressive increase in the H-ion concentration of soils treated with liming materials following the date of application. The measurement of the pH values for two acid loam soils treated with increasing applications of limosil showed typcial buffer curves for loam soils, whereas the pH values for a well-limed Penn loam free from humus showed little increase with increased applications.

Inspection of lime products used in agriculture, H. D. HASKINS, L. S. WALKER, and M. W. GOODWIN (*Massachusetts Sta. Control Ser. Bul. 38 (1926), pp. 6, fig. 1*).—Analyses of 23 samples of agricultural lime and 2 samples of gypsum registered in 1926 are reported, together with a chart showing the relative fineness of ground limestone from various sources. The purchase of agricultural lime on the basis of actual cost of 100 lbs. of effective oxides delivered at point of use is urged, the f. o. b. cost being given for the various samples.

Commercial fertilizers, 1926, J. M. BARTLETT (*Maine Sta. Off. Insp. 121 (1926), pp. 53–72*).—The usual analyses and guaranties of 302 samples collected in 1926 are reported.

The American fertilizer hand book (*Philadelphia: Ware Bros. Co., 1926, 19. ed., pp. [480], figs. 10*).—This number contains the usual standard reference material and directory of the commercial fertilizer industry and allied trades.

International trade in fertilizers and chemical products useful in agriculture—16th review, year 1925–26 (*[Rome]: Internatl. Inst. Agr., Bur. Gen. Statis., [1926], pp. 32*).—Data on the subject are presented for the year 1925–26. Special mention is made of such materials as natural phosphates, superphosphate of lime, basic slag, natural and artificial guano, bones and bone manure, potash fertilizers, sodium nitrate, ammonium sulfate, synthetic nitrogenous fertilizers, and other fertilizers.

It is stated that the upward trend of the world production of natural phosphates, which was noticeable in 1924, continued in 1925. A considerable increase in this respect was observed in the United States. International trade in phosphates developed in a corresponding degree.

The potash industry in 1925 showed a marked tendency to regain the ground lost during the two previous years in Germany, the most important center of production. The price of potash advanced steadily in the United States from the beginning of the second quarter of 1925, and especially toward the end of the first half of 1926. There was also a similar increase on the French market, while prices in Germany, after a rise at the end of April, 1925, remained steady until the end of June, 1926.

The increase in the production of Chilean nitrate was less marked in 1925 than during the previous year. A slight increase was observed in the production and export of Norwegian nitrate of lime, while the production of cyanamide of calcium also increased in France, Poland, and the United States. An increase in the production of ammonium sulfate occurred in Belgium, France, Italy, and the United States.

AGRICULTURAL BOTANY

Manual of botanical microtechnique, J. Kisser (*Leitfaden der Botanischen Mikrotechnik. Jena: Gustav Fischer, 1926, pp. VII+145, figs. 51*).—Instruments, manipulations, and related processes are detailed.

Life of plants, F. Keeble (*Oxford: Clarendon Press, 1926, pp. XII+256, figs. 52*).—The mode of treatment adopted presents in a popularized way the essential botanical facts.

Photosynthesis, H. A. Spoehr (*New York: Chemical Catalog Co., 1926, pp. 393, figs. 16*).—This volume, one of the American Chemical Society monograph series, discusses the manner in which the green plant utilizes solar energy, stressing the results of experimental observations rather than the conclusions arrived at by field observations or empirical methods. Experimental methods have demonstrated the complexity of the subject and emphasized the need for great experimental skill. An endeavor has been made to discuss the salient features of the subject with some consideration of those theoretical aspects which offer promise of fruitful development on the basis of experimental study.

The chapters deal severally with the origin of organic matter and the cosmical function of green plants, the nature of photosynthesis as determined by observations of gaseous interchange and the formation of organic matter, the products of photosynthesis, the methods of measuring photosynthetic activity, the chemistry of photosynthesis, the energy relations in photosynthesis, and chlorophyll and the chloroplasts.

The nature of the growth rate in plants, W. F. Hanna (*Sci. Agr., 5 (1925), No. 5, pp. 133–138*).—This brief bibliographical review (28 references), which constitutes the introductory portion of a thesis noted previously (E. S. R., 52, p. 632), is concerned chiefly with growth measurements, internal factors, and external factors in plant growth.

Ripening processes in seeds of Pharbitis [trans. title], Y. YOSHII (*Jour. Faculty Sci., Imp. Univ. Tokyo, Sect. III, 1 (1925), No. 1, pp. 139, pl. 1, figs. 20*).—A study on the ripening processes of seeds of *P. nil* deals more particularly with the germinability of the unripe seeds.

Problems in the physiology of germination, F. MERKENSCHLAGER (*Keimungsphysiologische Probleme. Freising: F. P. Datterer & Co., 1924, pp. 57, figs. 8*).—The greater portion of this contribution deals with reactions (resistance or responses) of seeds to various ions, alkaloids, temperatures, illuminations, irradiations, electrical currents, gases, inanition, narcotics, senescence, autotoxins, and infections.

A method for determining seed viability by electrical conductivity measurements, G. L. FICK and R. P. HIBBARD (*Mich. Acad. Sci., Arts, and Letters, Papers, 5 (1925), pp. 95–103*).—This account presents results of studies attempting to determine seed viability by using an electrical conductivity method, the fundamental principle of which is credited to Osterhout (E. S. R., 41, p. 819) as having demonstrated a difference between the conductivity of living and that of dead tissues.

The material used included seed of timothy, having a large endosperm, and seed of red clover, having no endosperm. Three methods were studied, the first measuring the resistance of the seeds themselves, the second comparing the relative absorption and excretion of salts, and the third measuring the relative outward diffusion of electrolytes as indicated by conductivity readings. The third method was adopted. The data indicate a correlation between electrical conductivity and seed viability, which with further improvement may be capable of practical application.

The relative light requirements of some coniferous seedlings, C. G. BATES (*Jour. Forestry, 23 (1925), No. 11, pp. 869–879, figs. 2*).—Seedlings of eight species of conifers were grown under artificial light containing many of the longer wave lengths of the visible spectrum and varying in intensity from 53.5 to 1.2 per cent during the first six months, and from 16.6 to 0.4 per cent during the last five months of the exposure. The results as studied suggest that in the forest light is not often likely to be the limiting factor in the survival of seedlings. In most instances in which light in the forest is a presumed limiting factor, it is not so in the absolute sense, though the variations in photosynthetic capacity between species give rise to long-term struggles for supremacy, in which rooting vigor and domination of root space, or ability to make good use of a small moisture supply, are almost certainly the determining characters. A study by Bates (E. S. R., 49, p. 535) is mentioned as leading to essentially the same conclusion, namely, that the struggle between species involves the ability of the species to make growth with a minimum use of water, and that the relative photosynthetic capacities of the species constitute an important element in the struggle.

Carbohydrate variations [in corn], A. N. HUME (*South Dakota Sta. Rpt. 1926, pp. 9, 10*).—A brief report is given of a study of carbohydrate variations in leaves and husks in early and late maturing varieties of corn. Samples of leaves from plants grown in the greenhouse were removed and determinations made of starch, pentosans, and sugars, and an examination of the results is said to show decided variations in photosynthesis between different plants. These differences are believed to be correlated not only with the arranged variations in temperature and light but also with the stage of development of the corn plants.

The first sugar of photosynthesis and the rôle of cane sugar in the plant, J. H. PRIESTLEY (*New Phytol., 23 (1924), No. 5, pp. 255–265; abs. in Bot. Gaz.,*

80 (1925), No. 2, p. 228).—Though available data are frequently interpreted to indicate that cane sugar is the primary product of photosynthesis, grounds are herein given for concluding that these data really support the formation of hexoses as the primary photosynthetic sugars. A consideration of the data as to the occurrence of cane sugar and hexoses in the vascular system indicates that cane sugar frequently appears in such a system upon its release from the differentiating protoplast. If this view be correct, cane sugar would not be directly connected with either the synthesis or hydrolysis of starch, but starch or other carbohydrate reserves or photosynthetic products would be used in the synthetic metabolism in the meristematic protoplast, and cane sugar would appear as a secondary product in the metabolism of this cell, being subsequently released occasionally from these cells as they vacuolate and differentiate.

Carbon dioxide assimilation [trans. title], O. WARBURG (*Naturwissenschaften, 13 (1925), No. 49–50, pp. 985–993, figs. 5*).—Studies during 1922–1925 on Chlorella in Knop solution are outlined with results in tabular, graphical, and descriptive detail.

Calcium oxalate monohydrate and trihydrate in plants [trans. title], A. FREY (*Vrtljschr. Naturf. Gessell. Zürich, 70 (1925), No. 1–2, pp. 1–65, pls. 2, figs. 16*).—This is a physiological study principally regarding phases of calcium oxalate compounds.

The relation of the salt concentration of the culture solution to transpiration and root respiration, J. D. NEWTON (*Sci. Agr., 5 (1925), No. 10, pp. 318–320*).—It is claimed to have been shown that the rate of plant-root respiration, as related to transpiration, increases when the salt concentration of the culture solution is increased, this fact indicating that as the concentration of the culture solution increases, the plant roots must expend more energy in absorbing a given volume of solution. It is shown also that the rate of transpiration is decreased when the concentration of the culture solution is increased, and it is pointed out that the concentration of the soil solution is one of the factors governing water requirements of crops. This is regarded as a matter of practical importance, as the concentration of the soil solution may be modified to some extent by cultural and manurial treatments.

On the root system as an osmotic apparatus [trans. title], D. A. SABININ (*Izv. Biol. Nauch. Issledov. Inst. Permsk. Gosud. Univ. (Bul. Inst. Recherches Biol. Univ. Perm), 4 (1925), Sup. 2, pp. 136, figs. 2; Eng. abs., pp. 129–136*).—Methods claimed to embody somewhat widely applicable new features are described, and results are detailed as regards movements of water and solutes in plant roots.

Osmotic pressure was perceptible in all saps examined. It appears that the root is not a passive conductor of solutions into the upper parts of the plant, but an organ performing important work in the concentration of ions in the sap current. Such a concentration is thought to be possible on a basis of Donnan membrane equilibriums. Permeability of protoplasm did not appear to be a factor limiting the concentration of a given ion in the sap current, as it is the concentration of substances on which the Donnan equilibriums in the root systems depend which determines the concentration of ions in the sap. This conclusion places the problem of studying the osmotic processes in the root systems on a somewhat special basis, the problem of osmotic penetration of electrolytes into the root systems becoming one which is not biophysical but biochemical. The task which is indicated by the facts established in this work is that of determining which sap electrolytes are influential in concentrating the ions in the external solution.

The effects of an artificially controlled hydrion concentration upon wound healing in the potato, G. A. C. HERKLOTS (*New Phytol., 23 (1924),*

No. 5, pp. 240–255, pl. 1, figs. 2).—A study of healing in cut potatoes shows the necessity for the presence of atmospheric oxygen for both suberization and meristematic activity. Acetates alone in acid buffer solutions proved toxic to potato tissues. All buffer jellies, regardless of salts employed, kill at acid and not at alkaline pH. The range of toxic effect has its maximum at pH 4.2 and its minimum at pH 7. Disintegration of the pectic substances of the middle lamella never occurs with buffers more acid than pH 5. The fats released by the potato are in the form of unsaturated fatty acids. Alkalinity (especially from pH 7.5) promotes suberization but retards meristematic activity. After a suberized block has been formed acidity (at least up to pH 4.6) promotes phellogen activity, but retards its subsequent suberization.

[**Leaf variegation and bacteria**], G. E. MATTEI (*Riv. Biol., 8 (1926), No. 1, pp. 41–61, figs. 4*).—Evidence, with discussion, is presented, bearing upon the question whether leaf variegation may be due to bacteria.

Foliar anomalies in Medicago sativa [trans. title], A. DRAGHETTI (*Staz. Sper. Agr. Ital., 56 (1923), No. 4–6, pp. 153–177, figs. 22*).—Alfalfa leaf anomalies are systematically discussed.

Floral abortion in the olive [trans. title], A. MELIS (*Staz. Sper. Agr. Ital., 56 (1923), No. 7–9, pp. 302–312, figs. 5*).—Weather and other conditions, and probably not heredity, are responsible for floral anomalies indicated as conditioning barrenness.

Effects of X rays on plant tumors [trans. title], V. RIVERA (*Riv. Biol., 7 (1925), No. 4–5, pp. 449–465, figs. 4*).—It is stated that in several plants studied experimentally the effects of X-ray treatments on tumors caused by *Bacterium tumefaciens* was positive. The tumors, after a period of continued growth following inoculation (regarded as a latent period), cease growth and become yellowed and dry, the surrounding tissue of the plant remaining normal.

Transformations induced by X rays in plant tumor tissue [trans. title], V. RIVERA (*Riv. Biol., 8 (1926), No. 1, pp. 1–15, figs. 4*).—In tumor tissue that had appeared after exposure to X-rays in Pelargonium, one of the genera mentioned in the article noted above, it was found that the treatment had determined in the body of the tumor the formation of a globular region which had undergone a differentiation and detachment from the rest of the tumor formation. The characters and the mode of formation of this portion are discussed.

Bacterial symbiosis in plants other than the legumes, J. K. WILSON (*Jour. Amer. Soc. Agron., 16 (1924), No. 6, pp. 373–381*).—It is stated to be the purpose of this review to point out some of the probable symbiotic relations existing between certain plant families other than the Leguminosae and bacteria. It is stated that bacteria may be found not only in the tissues of many plants but also in the buds, flowers, and seeds. In certain instances, designated as cases of hereditary symbiosis, the bacteria which are found in the seed may pass through the tissue of the growing plantlet and subsequently appear in the leaves and bloom and finally enter the growing seed and there remain. This condition has been observed in the Myrsinaceae and the Rubiaceae. In the latter of these the bacteria enable the plant to secure free nitrogen from the air for its own use. These bacteria from the plants of the Rubiaceae and possibly from the Myrsinaceae, when grown under suitable conditions in culture media, increase the nitrogen content. Plants of the Rubiaceae, when deprived of bacteria and grown in a nitrogen-poor substratum, fail to increase their nitrogen content and show nitrogen starvation. Myrsinaceae plants, when deprived of their bacterial symbiont, show inferior growth and nitrogen starvation.

On the occurrences of a species of Colletotrichum, W. SMALL (*Brit. Mycol. Soc. Trans., 11 (1926), pt. 1–2, pp. 112–137*).—As a result of studies on strains

of a Colletotrichum which the author has found convenient to refer collectively to *C. coffeanum*, these strains appear not to be genetically stable and not distinguishable as physiological entities. Suggestions are offered as to the naming of certain forms.

Polyporaceae in Bulgaria [trans. title], B. B''ʀᴢᴀᴋᴏᴠ (Bᴀʀsᴀᴋᴏᴡ) (*Izv. B''lgarsk. Bot. Druzh.* (*Bul. Soc. Bot. Bulgarie*), *1* (*1926*), *pp. 21–36; Ger. abs., p. 36*).—The study here outlined of Bulgarian Polyporaceae includes Polyporus (25 species), Boletus (15 species), Physisporus (2 species), Merulins (1 species), Trametes (1 species), Daedalea (2 species), and Lenzites (2 species).

GENETICS

Genetics [trans. title] (*Ann. Sci. Agron. Franç. et Étrang.*, *43* (*1926*), *No. 3, pp. 230–256*).—Breeding work with field crops under the direction of the Institute of Agronomic Research in France during 1925 supplemented and continued the studies already recorded (E. S. R., 55, p. 223).

Gigantism and genetic constitution in tetraploid genera and species [trans. title], C. Aʀᴛᴏᴍ (*Riv. Biol.*, *7* (*1925*), *No. 4–5, pp. 533–555*).—This is largely a synthetic review dealing with genetic relations in plants showing gigantism and other anomalies.

Linkage and synthetic lethality among the chlorophyll factors of barley [trans. title], C. Hᴀʟʟǫᴠɪsᴛ (*Hereditas*, *8* (*1926*), *No. 1–2, pp. 229–254, figs. 2*).—Forty-two of 78 possible combinations between 13 factors were studied in some detail. Three strong linkages were found, the remainder of the cases showing free combination. The data did not permit the author to draw parallels between chromosome number and linkage groups in barley.

Inheritance of quantitative and other characters in a barley cross, K. W. Nᴇᴀᴛʙʏ (*Sci. Agr.*, *7* (*1926*), *No. 3, pp. 77–84, figs. 8*).—The inheritance of a number of characters was studied in the F_2 of Guy Mayle×Canadian Thorpe barley at the University of Saskatchewan. The two varieties involved differ widely in earliness, height, density, and outer glume length, and Guy Mayle is 6-rowed and hull-less and Canadian Thorpe 2-rowed and hulled.

Time of maturity, height, and density seemed to depend on two or more independently inherited factors, while length of outer glume depended upon two factors, one of which is not expressed in the presence of the factor for hulled seed. A single main factor difference was apparent between 2-rowed and 6-rowed varieties. The hull-less condition behaved as a simple recessive to the hulled condition. The quantitative characters, maturity, height, and density were all shown to be linked with lateral floret fertility. Two-rowed forms tend to be late, tall, and dense, whereas 6-rowed forms have the reverse tendency.

A genetical interpretation of ecological adaptation, K. Sᴀx (*Bot. Gaz.*, *82* (*1926*), *No. 2, pp. 223–227*).—In a cross of Improved Yellow Eye × Small White beans at the Maine Experiment Station there was a simple 3:1 segregation for pigmented v. white and for mottled v. self-colored in F_2. These differences in seed coat pattern are associated with differences in yield per plant, indicating linkage between these qualitative factors and factors for plant yield. In F_3, under unfavorable conditions, mottled segregates outyielded self-colored or white segregates, while in F_4, when all classes were relatively productive, the white segregates excelled. This behavior seemed to suggest that the yield factors depend on environmental conditions for their expression, and that ecological adaptation and distribution of economic plant varieties depend on genetic factors.

The effect of environment on variegation patterns in maize pericarp, W. H. Eʏsᴛᴇʀ (*Genetics*, *11* (*1926*), *No. 4, pp. 372–386, figs. 6*).—Strains of corn

with variegated pericarp and strains with orange pericap were grown by the Missouri Experiment Station under strikingly different environmental conditions at Chula Vista, Calif., and at Sacaton, Ariz., as a preliminary study of the relation of environmental factors on the somatic expression and genetic changes of these pericarp color patterns. The higher and more variable temperature and the greater transpiration at Sacaton were apparently the chief environmental differences between the two localities. Consequently, the pericarp at Sacaton matured fully a month sooner than at Chula Vista.

In every case of the eight variegated strains grown at each locality a definite and consistent difference was noted in the variegation pattern. The California-grown variegations consistently had more red markings, covering one-fourth the surface of a kernel, and larger areas than the Arizona-grown variegations. The significance of this difference seemed to be that under the California conditions more of the color changes extended into the germ plasm and thus became genetic. Changes from orange to variegation and from orange to red also occurred more frequently under the California conditions.

Genetic factors for yellow endosperm color in maize, E. G. ANDERSON (*Mich. Acad. Sci., Arts, and Letters, Papers, 4 (1924), pt. 1, pp. 51–54*).—Experiments reported and cited concerning yellow endosperm factors in corn indicate that three factors are known well enough to be used in linkage tests and other studies. *Y*—yellow, a dominant factor, gives the deep yellow to orange-yellow endosperm color found in nearly all yellow varieties of corn. Dominance is incomplete, the heterozygous forms being lighter in color than the homozygous dominant. *Y* has been shown to be linked with *Pl*, *sm*, pm_1, W_5, W_8, *and* W_1. *Yp*—pale yellow, also dominant, gives a pale or light yellow color and is known to be linked with a factor for pale green seedling color. *Wh*—dominant white endosperm color, is dominant to both deep and pale yellow, bnt dominance is incomplete. Chief among modifying factors are those factors affecting endosperm textnre.

A botanical study of the flax plant.—VII, A preliminary account of the genetics of flower colour and other related characters, G. O. SEARLE (*Linen Indus. Research Assoc., Research Inst. Mem. 35 (1926), pp. 115–134, pl. 1*).—Four flax varieties with white, violet, pink, and dark violet flowers, respectively, were involved in the breeding experiments (E. S. R., 53, p. 522) described. The interaction of these four types agreed fairly closely with the Mendelian hypothesis of segregation, and all forms arising from crosses of these types were explainable by using four factors. The possibility of obtaining 16 homozygous forms is indicated. The relationship between color and other flower characters is discussed, and it is shown how the flower characteristics may be related to other characters of the flax plant.

The extent of natural cross-fertilization in jowar (Andropogon sorghum) at Surat, G. B. PATEL (*Agr. Jour. India, 21 (1926), No. 5, pp. 366–370*).—Under prevailing conditions, natural cross-fertilization occurred to the extent of 25 per cent on the average in sorghum in rows 3 ft. apart, and every plant examined up to 6 ft. away showed contamination. The progression of flowering in sorghums of the Surat District is traced.

Inheritance in Nicotiana tabacum.—VII, The monosomic character, "fluted," R. E. CLAUSEN and T. H. GOODSPEED (*Calif. Univ. Pubs., Bot., 11 (1926), No. 3, pp. 61–82, pls. 3, figs. 2*).—The seventh number of this series (E. S. R., 55, p. 328) describes a form, fluted, occurring spontaneously in *N. tabacum* cultures in about 1:150 in frequency and characterized by distinct morphological features, which on cytological examination was found to be a monosomic ($2n$-1). About 60 per cent of the functioning ovules and 2 per

cent of the functioning pollen grains were (n–1). Selfing fluted seemed to give a somewhat lower rate of transmission than expected. Fluted involved a different chromosome set than trisomic enlarged and was independent of five other linkage groups. Crosses of fluted tabacum × sylvestris give fluted and normal F_1 sylvestris-tabacum hybrids with more pronounced morphological differences than those between fluted and normal tabacum, particularly in flower color.

Interspecific hybridization in Nicotiana, III–V (*Calif. Univ. Pubs., Bot., 11 (1926), Nos. 4, pp. 83–101, figs. [2]; 5, pp. 103–115, figs. 6; 11 (1927), No. 6, pp. 117–125, figs. 8*).—Three studies are reported on.

III. *The monosomic tabacum derivative, "corrugated," from the sylvestris-tabacum hybrid*, R. E. Clausen and T. H. Goodspeed.—An inconstant derivative termed "corrugated," on account of its distinct leaf type, was established by selfing a partially fertile individual from the back cross of the F_1 *N. tabacum macrophylla-N. sylvestris* hybrid to *N. tabacum macrophylla*. Although character differences between corrugated and normal are complex, they seem to behave as a unit in heredity. Cytological examination showed that corrugated is a monosomic (2n–1) tabacum derivative.

The behavior of corrugated, selfed and in crosses with *N. sylvestris* and *N. tabacum*, is described. Crosses of corrugated with white tabacum showed that the chromosome set involved in the production of corrugated bears the factors *W w* for colored v. white flowers. Applied to the problem of the return of tabacum derivatives from the sylvestris-tabacum hybrid to the pure parental condition, the results seemed to indicate that selective functioning of pollen grains is largely responsible for doubling up of unpaired tabacum chromosomes.

IV. *Some cytological features of the paniculata-rustica hybrid and its derivatives*, T. H. Goodspeed, R. E. Clausen, and R. H. Chipman.—This paper is primarily concerned with cytological phenomena observed in the *N. paniculata-N. rustica* hybrid and its derivatives.

V. *Cytological features of two F_1 hybrids made with Nicotiana bigelovii as a parent*, T. H. Goodspeed and R. E. Clausen.—The cytological features of F_1 of *N. bigelovii* × *N. suaveolens* and of *N. bigelovii* × *N. glutinosa* are described and discussed.

A cytological study on the pollen sterility in Solanum tuberosum L., I. Stow (*Imp. Acad. [Japan], Proc., 2 (1926), No. 8, pp. 426–430, figs. 7*).—Experiments at Hokkaido University involving 16 varieties of potatoes showed the haploid number of chromosomes to be 24. The reduction division of the pollen mother cells proceeds normally at 15 to 20° C. (59 to 68° F.) and normal tetrad cells, later developing to fertile pollen grains, are produced. Abnormalities occurred at higher (25–30°) temperatures, and the degree of abnormality in the meiotic division appeared to vary according to the potato variety.

A recessive glabrous character in soybeans, R. T. Stewart and J. B. Wentz (*Jour. Amer. Soc. Agron., 18 (1926), No. 11, pp. 997–1009, figs. 3*).—In a new type of soy bean designated as p_2 in this contribution from the Iowa State College, pubescence seems to be absent, but a small hand lens reveals short, fine hairs. Glabrous plants are much smaller than the pubescent, produce few pods, and their leaves are much smaller than leaves of normal plants and exhibit a crinkled and dwarfed condition. The glabrous character perhaps arose from a mutation in the germ cells of one of the parents in the cross Soysota × Ogemaw. The inheritance seems to be controlled by a single pair of Mendelian factors, glabrousness being recessive. It is yet doubtful whether this character differs from that (P_1) reported by Nagai and Saito (E. S. R., 54, p. 825), or whether an inhibitor (P_2) causes the same

character (P_1) to behave differently. More natural cross pollination was observed between normal and glabrous plants than apparently has been reported in previous soy bean studies.

Natural crossing in soybeans, R. J. GARBER and T. E. ODLAND (*Jour. Amer. Soc. Agron.*, *18* (*1926*), *No. 11*, *pp. 967–970*).—In the soy bean varietal experiments at the West Virginia Experiment Station where each variety was grown in 4-row plats with rows 30 in. apart, natural crossing between varieties in adjacent rows was determined to be 0.14 per cent in 1922 and 0.36 per cent in 1923.

Practical sugar cane genetics, C. F. POOLE (*Assoc. Hawaii. Sugar Technol. Rpts.*, *4* (*1925*), *pp. 150–159*).—A discussion of sexual and asexual improvement of sugar cane and of factor relations in quantitative inheritance.

Genetics and its relation to cane production, F. G. KRAUSS (*Assoc. Hawaii. Sugar Technol. Rpts.*, *4* (*1925*), *pp. 177–194*, *fig. 1*).—A summary is given of replies to a questionnaire on problems, methods, and results of sugar cane breeding work in Hawaii.

Chromosome behaviour in triploid wheat hybrids, W. P. THOMPSON (*Jour. Genetics*, *17* (*1926*), *No. 1*, *pp. 43–48*, *figs. 8*).—Cytological studies at the University of Saskatchewan showed 3 to 7 bivalent and 15, 13, 11, 9, or 7 univalent chromosomes to appear at the heterotype division of the hybrid between *Triticum monococcum* and a variety of *T. turgidum*. After the bivalents divided the univalents all arranged themselves on the plate and divided equationally. At the homotype division some chromosomes lagged, failed to divide, and wandered at random to the poles, their number corresponding to that of the univalents of the first division. This behavior resembles that in pentaploid hybrids except in regard to the variable amount of mating. It is similar to that in *T. monococcum*×*T. dicoccum*, except that in the latter a number of univalents fail to divide at the heterotype division.

The morphology and cytology of some hybrids of Aegilops ovata L. ♀×wheats ♂, J. PERCIVAL (*Jour. Genetics*, *17* (*1926*), *No. 1*, *pp. 49–68*, *pls. 6*).—The characteristics of hybrids obtained between *A. ovata* and several forms of *Triticum dicoccoides*, *T. dicoccum*, *T. durum*, and *T. vulgare* are set forth. It is noted that the reciprocal crosses were unsuccessful and that all the hybrids were sterile. While the hybrids were intermediate in quite a number of characters, empty glumes of the hybrids were longer than in either parent. The only dominant characters observed were fragility of the rachis of the wild emmer and the mode of disarticulation of the inflorescence of the Aegilops parent.

The basic chromosome number in Triticum and Aegilops is 7, with similar polyploid species, $2x$, $4x$, and $6x$. In both the pentaploid and the tetraploid hybrids investigated pairing of the chromosomes in metaphase of the heterotype division was loose, and longitudinal division of the chromosomes frequently occurred soon after the univalents began their movement toward the poles of the heterotype spindle. In these Aegilops×wheat hybrids the chromosomes passed to poles of the spindle in both the heterotype and homotype divisions in two groups, one of them lagging behind the other. Tetrad formation was generally very irregular, and microspores of several different sizes were produced, some of which when fully developed were empty and others containing two or more nuclei with variable numbers of chromosomes. Twin microspores were also produced. Sterility of the hybrids seemed connected with these irregularities.

A study of wheat-rye hybrids [trans. title], N. MEISTER (*Zhur. Opytn. Agron. I͡Ugo-Vostoka* (*Jour. Expt. Landw. Südost. Eur.-Russlands*), *3* (*1926*),

No. 1, pp. 121–130, fig. 1; Eng. abs., p. 130).—Continued studies of the progenies of wheat-rye hybrids (E. S. R., 48, p. 735) revealed forms beyond the ranges of the *Triticum vulgare* parents, some resembling "wild wheat," *T. spelta*, and *T. dicoccum*, and still others approaching *T. durum*. Certain segregates surpassed the winter-wheat parents in winter hardiness and quality of grain.

Segregation in fertile hybrids between wheat and rye, L. Blaringhem (*Compt. Rend. Acad. Sci. [Paris], 183 (1926), No. 22, pp. 1049–1051*).—Observations on the behavior of different characters in F_1 and subsequent generations in *Triticum spelta*×*Secale* sp. and *T. turgidum*×*Secale* sp. are recorded and discussed.

Chromosome behavior in a cross between wheat and rye, W. P. Thompson (*Genetics, 11 (1926), No. 2, pp. 317–332, figs. 9*).—Investigations reported on from the University of Saskatchewan dealt with chromosome behavior in the parental and subsequent generations of a cross between a spring wheat of Chinese origin (*Triticum vulgare albidum*), having 21 haploid chromosomes, and Prolific spring rye with 7 chromosomes. The proportion of successful crossings was as high as in crosses between wheat varieties, and the F_1 was very vigorous and not wholly sterile.

Heteroploidy and somatic variation in the Dutch flowering bulbs, W. E. de Mol (*Amer. Nat., 60 (1926), No. 669, pp. 334–339*).—Among the hundreds of bud variations (some of which are described in this paper) occurring in the principal varieties of flowering bulbs, there are only a few rare cases of concomitant changes of chromosome number or of nuclear structure. Heteroploidy, manifested so strongly in hyacinth and narcissus, is not considered by the author to be correlated with the process of somatic variation. The gametophyte rather than the sporophyte has a mutable nuclear structure.

FIELD CROPS

Crop returns under various rotations in the Wisconsin drift soil area, W. H. Stevenson, P. E. Brown, and L. W. Forman (*Iowa Sta. Bul. 241 (1926), pp. 225–263, figs. 10*).—Crop rotations were compared with continuous culture on a typical field in the Wisconsin drift soil area of Iowa, and the merits of various fertilizer treatments were studied under the different cropping methods. The tests involved a 5-year rotation of corn, oats, clover, wheat, and alfalfa, keeping the alfalfa on the same plats 5 years; a 4-year rotation of corn, corn, oats, and clover; a 3-year rotation of corn, oats, and clover; a 2-year alternation of corn and oats; and continuous corn. The treatments, employed in amounts of ordinary practice, centered around the use of farm manure, which represented the livestock system of farming, and the turning under of crop residues, which represented the grain system. Lime was applied as shown to be needed. In the 2-year and 3-year experiments rock phosphate was also tested with the manure and lime or with the crop residues and lime. In the 4-year and 5-year rotations rock phosphate and acid phosphate were both used, either with manure and lime or with crop residues and lime.

The value of crops grown over a 10-year period appeared to be greater under the 4- or 5-year rotations than under the 3-year system or from the 2-year alternation or continuous corn. In this respect the 4-year rotation surpassed or equaled the 5-year system in all cases, except that the 5-year rotation showed greater values of crop increases where acid phosphate, manure, and lime were applied. The crop values under the 5-year system exceeded those under the 3-year rotation except where manure, lime, and rock phosphate were applied and also where crop residues and lime were used.

In general, the longer rotation of 4 or 5 years probably may be more valuable over a period than the shorter 3-year rotation, which in turn is definitely preferred to the 2-year system or to continuous cropping. The value of applications of manure, lime, and a phosphate fertilizer to soils in this area under various rotations was definitely shown. It seemed that in many cases acid phosphate may be more profitable than rock phosphate on these soils.

Fixation of nitrogen by legume nodule bacteria grown in pure culture [trans. title], C. BARTHEL (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 308 (1926), pp. 16, fig. 1; Eng. abs., p. 16*).—Experiments with a strain of *Bacterium radicicola* gave negative results regarding its ability to fix atmospheric nitrogen when grown in pure culture. Addition of 0.1 per cent of caffeine to the nutrient solution did not influence the result positively.

Fleshy annual pastures in Canada, G. P. MCROSTIE ET AL. (*Canada Dept. Agr. Pamphlet 73, n. ser. (1926), pp. 8, figs. 7*).—General information is presented on the culture of rape, kale, and cabbage in Canada, and the results of tests on these crops at some of the Dominion Experimental Farms and stations are summarized.

Bagging cotton flowers to prevent accidental cross-pollination, T. H. KEARNEY and D. D. PORTER (*Jour. Heredity, 17 (1926), No. 8, pp. 273–279, pl. 1, figs. 3*).—The technique used in bagging Egyptian cotton flowers to prevent cross-pollination (E. S. R., 49, p. 226) is described, and data are cited regarding cross-pollination, the effectiveness of bagging, and local insect carriers of pollen. Unless artificially pollinated, bagged flowers produce fewer seeds per boll, doubtless because pollen reaches only that part of the stigmas in contact with or immediately above the uppermost anthers. White bags were found more efficient than colored bags.

An account of experiments carried out to determine the experimental error of field trials with cotton in Egypt, M. A. BAILEY and T. TROUGHT (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 63 (1926), pp. [2]+29, pls. 23*).—Experiments to determine the amount of variability to be expected in field trials with cotton led the authors to recommend that no paths be left between beds, but that ridges bordering the bed should be uprooted at picking time, tenfold repetition of variety beds, and continuation of trials for at least 3 years. Beds should be in the form of long strips (up to 16 times as long as wide), sited along the length of the ridges to facilitate planting, and where possible ⅕ feddan (about ⅕ acre) in area. Where sufficient land or seed is not available, fewer replications should be used and the strips divided into two or even three equal parts at harvest to maintain the required number of comparisons between adjacent beds. Results should be computed by the method of differences.

Ninety references are given concerning experimental procedure, and a method is suggested by U. Yule for obtaining the standard error of a difference between two means in a chessboard variety experiment.

The cotton growing countries present and potential: Production, trade, consumption (*Rome: Internatl. Inst. Agr., Bur. Gen. Statis.; London: P. S. King & Son, 1926, pp. XXXVI+317*).—The production of cotton in important political divisions of the world is described briefly as in an earlier note (E. S. R., 49, p. 529), with statistics of yields, acreages, commercial movement, and prices.

Johnson grass in Texas, E. O. POLLOCK (*Texas Sta. Circ. 43 (1927), pp. 15, fig. 1*).—Designed to aid in the better management of fields on which Johnson grass is already established, this circular indicates the adaptation and distribution of the plant, and describes production methods for hay and seed, its

value for pasture, its place in the cropping system, and means for its eradication. Brief abstracts are given of laws affecting the production and shipping of Johnson grass hay.

Breeding winter oats for the South, T. R. Stanton (*Jour. Amer. Soc. Agron., 18 (1926), No. 9, pp. 804–814, fig. 1*).—Breeding work with winter oats at the Arlington, Va., Experiment Farm developed two strains of Winter Turf which during the period 1916–1925 outyielded unselected stock by about 8 bu. per acre. Definite winter types isolated from Fulghum seem more cold-resistant and yield better than the original Fulghum. Several high-yielding strains of winter oats developed from Winter Turf×Aurora satisfactorily combine the earliness and kernel characters of Aurora with the winter resistance of Winter Turf. Other winter oats breeding activities of the U. S. Department of Agriculture are outlined briefly. The maintenance of varietal identity is indicated as an important problem confronting southern oats growers.

[Potato experiments in New Brunswick], D. J. MacLeod (*Canada Expt. Farms, Div. Bot. Rpt. 1925, pp. 43–45, 48–50*).—In the production of certified seed close spacing appeared superior to thin planting because of the smaller number of large tubers in the former. Growers of Irish Cobbler and Green Mountain seed potatoes might adopt the practice of planting as close as is consistent with roguing. Selected Green Mountain seed grown on seven types of soil revealed tendencies for soils such as coarse sand and black muck to product short round tubers and heavier soils such as ordinary sandy loam and clay to yield longer types.

Potatoes were stored under dry and damp conditions in burlap containers in contact with certain salts, fertilizer ingredients, fungicides, and commodities of general consumption such as are shipped in bags often used subsequently by potato shippers. Salts, particularly when brought in contact with the moistened surface of tubers, readily dissolve and entering through the lenticels infiltrate the surrounding tissues, producing necrosis.

Epsom salts, sodium nitrate, potassium nitrate, and coarse common salt appeared similar in severity of action, and ammonium sulfate, while slightly slower, ultimately produces like conditions. Bordeaux dust and acid phosphate produced restricted necrotic sunken areas involving only the tissues adjacent to the lenticels, leaving the rest of the tuber otherwise firm and normal. The former under dry conditions produced no apparent injury. In dry storage all the salts produced very much modified conditions as outlined. Flowers of sulfur effected no change. Cane sugar resulted in a very slight necrosis around a few lenticels under damp storage but produced no abnormality under dry conditions. Tea, coffee, cocoa, potato starch, corn meal, and bran do not produce necrosis but by their hygroscopicity induce an enlargement of lenticels and also provide media for development of rot-producing organisms which are afforded readier penetration through the lenticels.

Deep-eyed as opposed to shallow-eyed varieties seem predisposed to greater ravages by chemicals, and varieties with thin skin were found extremely susceptible to the rapid infiltrating and diffusing action of chemicals. The deleterious effects exhibited seem to demand that all sacks used to contain potatoes should be thoroughly washed before using, to insure complete removal of injurious substances.

Potato growing in Colorado, E. P. Sandsten (*Colorado Sta. Bul. 314 (1927), pp. 30, figs. 5*).—The status of potato production in the State is outlined, and accounts are given of soil and fertility needs, handling seed, varieties for different sections of Colorado, cultural and field methods, and harvesting and

storage practices. Important diseases and control methods are described briefly.

A method of crossing sorghums, H. N. Vinall (*Jour. Heredity, 17 (1926), No. 8, pp. 296–299, figs. 3*).—This method involves the use of a glass plate (about 6 by 8 in.) to collect pollen from the male parent. Several advantages are indicated.

Report on the sugar beet experiments [in Ireland], 1925 (*Dublin: Dept. Lands and Agr., 1926, pp. 54*).—Experimental results with sugar beets in 1925 considered with previous (1911–1913) results demonstrated that with proper care and management crops comparing favorably in yield and sugar content with continental crops can be grown in Ireland. While German and Dutch varieties appeared somewhat superior to the Danish and French varieties in sugar content, no marked difference in yields was noted. Any soil producing satisfactory root crops seemed suitable for sugar beets. The position of sugar beets in the rotation did not influence yield or sugar content materially. Top-dressing with sodium nitrate at the rate of 1 cwt. per acre after singling increased the average yield without lowering sugar content, and seemed to stimulate the growth of crops backward because of mangel fly attack or unfavorable soil or weather conditions. Relatively narrow drills and thorough and frequent after-cultivation were indicated for maximum yields.

The effect of increased applications of sodium nitrate on the quality of sugar beets [trans. title], J. Souček (*Ztschr. Zuckerindus. Čechoslovak. Repub., 50 (1926), Nos. 47–48, pp. 419–422; 49, pp. 499–503; 50, pp. 507–514*).—In 65 comparative fertilizer experiments with sugar beets in 1924 in Czechoslovakia, similar to and in continuation of previous (1923) work (E. S. R., 52, p. 834), sodium nitrate applications were equivalent to 0, 100, 200, 300, and 450 kg. per hectare (0, 89, 178, 267, and 400.5 lbs. per acre). As general averages the respective yields of beets amounted to 32,900, 35,400, 37,000, 38,400, and 39,800 kg. per hectare; leaves 16,900, 18,600, 20,200, 21,600, and 23,400 kg.; sugar content 19.18, 19.31, 19.33, 19.35, and 19.18 per cent; purity of juice 89.8, 90.2, 90.1, 90.2, and 90; and nitrogen content of root 0.141, 0.14, 0.144, 0.148, and 0.156 per cent.

Contrary to results in 1923, sodium nitrate produced enhanced yields of roots and leaves under the influence of favorable weather conditions and caused reduction in neither sugar content nor purity of juice, the latter being rather larger in the treated beets. The beets of 1924 were more mature than those of 1923; they had relatively fewer leaves. The nitrogen content of the root was augmented slightly by progressive additions of sodium nitrate, and more beets per unit area were found on treated plats. In the 44 tests where the soil was analyzed, the influence of sodium nitrate apparently varied according to the nitrogen and calcium carbonate contents of the soil, its mechanical condition, and time of harvest. Sodium nitrate affected the yield and quality of the beets more favorably when the soil contained less nitrogen, when the beets were riper, and where the soil had a high moisture capacity (heavy clay). When the soil had a small calcium content, the effects of the 100 and 200 kg. applications of sodium nitrate were most intensive, probably due to neutralization of soil acidity.

The composition of biennial white sweet clover as related to soil enrichment, A. L. Whiting and T. E. Richmond (*Soil Sci., 22 (1926), No. 2, pp. 83–95*).—The composition of tops and roots of biennial white sweet clover was determined at various growth stages at the Illinois Experiment Station to get information on handling the crop in cropping systems.

Sweet clover tops appeared to decrease in nitrogen, phosphorus, and sulfur with maturity the first season, while the roots increased in nitrogen and apparently in other elements while increasing in dry matter. In the second season the roots increased slightly at first and then decreased, paralleling somewhat the concurrent decrease in the tops. These changes seemed partly due to translocation.

Nitrogen was the outstanding element in both tops and roots at most sampling periods, much being found in a soluble form in the roots. Mineral elements are present in quantity generally in the order potassium, calcium, magnesium, sulfur, and phosphorus. Potassium and calcium appeared to be needed in relatively large amounts. More calcium is present in seed and leaves than other elements except nitrogen. The magnesium present in the seed equals about one-third of the phosphorus content, whereas two or three times as much magnesium as phosphorus is present in the leaves. Sulfur occurs in relatively large amounts and exceeds phosphorus in most cases. It is high even in the seed and very high in the leaves. More phosphorus was found in the fall roots than in other samples. Analyses of root samples taken in the fall at 0 to 7 in. and 7 to 40 in. showed that the roots at considerable depth maintain the same percentage composition as near the surface. Data cited indicated that the composition of sweet clover may be influenced considerably by applications of limestone, phosphorus, and potassium.

[Tobacco investigations in Canada in 1925], C. M. Slagg, J. E. Montreuil, H. A. Freeman, and T. G. Major (*Canada Expt. Farms, Tobacco Div. Rpt. 1925, pp. 40, figs. 6*).—Tobacco investigations (E. S. R., 55, p. 738) in Canada during 1925 embraced varietal studies at Ottawa and elsewhere in the Dominion, fertilizer, seed bed, and rotation experiments, and notes on the nicotine content of varieties variously treated. A report by Freeman on the status of Canadian tobacco in the British Isles, a discussion by Major of progress in disease studies, and the usual statistics on acreage and yield in Ontario and Quebec are also included.

Glass-covered semihotbeds excelled in production of early, vigorous seedlings at both Harrow, Ont., and Farnham, Que., and treatment of seeds with various organic and inorganic mercury compounds showed little or no advantages. Beds made and steamed in the fall were fully as satisfactory as those made and steamed in the spring.

At Harrow it has been found possible to control the root-rot disease when tobacco is grown in 4-year rotations of corn, grain, hay, tobacco, and corn, tobacco, grain, hay. The best results in fertilizer tests were obtained on flue-cured tobacco with formulas supplying ammonium sulfate, acid phosphate, and potassium sulfate equivalent to 1,000 lbs. of 2.8–9–10 of mixed fertilizers per acre, with Burley equivalent to 1,000 lbs. of 9–8–6, and with the Green River type to 1,000 lbs. of a 5–6–7.5 mixture. Drilling again proved superior to broadcasting fertilizer, and the most satisfactory rate for manure used with commercial fertilizer was 14 tons per acre. From the viewpoint of yield, manures at the acre rate of 12 tons ranked in the order poultry, sheep, horse, cow, and hog. Little difference was noted in the quality of cured leaf.

The use of commercial fertilizers improved both yield and quality of cigar binder tobacco grown at Farnham, whereas lime lowered both yield and quality. Using commercial fertilizer with manure gave an average yield of 200 lbs. more per acre and a net profit of about $20 per acre over manure applied alone.

A disease survey showed that damping-off in the seed bed, Thielavia root rot in the bed and field, and mosaic continue to be the most serious troubles

affecting tobacco in Canada. Steaming seed bed soil for 30 minutes at 50 lbs. pressure satisfactorily controlled Thielavia root rot. In tests of certain commercial preparations as soil disinfectants the dust treatments injured the germination and stand and reduced the size of plants. Formaldehyde preparations did not seem as injurious to the host plants as the organic mercury compounds. Soaking seed with water before sowing appeared to stimulate growth somewhat. Air-dried samples of sandy loam soils were found slightly more acid than fresh samples.

On the biology of tobacco fermentation [trans. title], J. J. SCHMIDT (*Tropenpflanzer, 28 (1925), No. 2, pp. 64–68*).—Investigations by the author revealed striking differences in the bacterial flora of tobacco from different sources and differing in quality. Development of microorganisms present on the green leaves was found to occur during the fermentation process. Species differed in their development according to the optimum temperatures for their groups. The flora of tobaccos differing in source and quality varied in respect to numbers and types of species of microorganisms. No differences in the number of species were observed between similarly fermented German and foreign tobaccos. The imported and domestic tobaccos differed regarding the species of microorganisms found thereon, although the bacteria pertained to the same groups. Differences in number and kind of species were observed on tobacco fermented by different methods, e. g., German and North American. The bacteria isolated from domestic and foreign tobaccos could be grouped according to their physiological characteristics and temperature optimums as cocci, short rods, and fluorescent types, spore producers of the size and type of *Bacillus mycoides* and *B. megatherium*, mesentericus forms, and Plectridia and Clostridia (only from poor quality tobacco). The bacteria from different tobacco varieties were observed to behave differently in their relation to protein and carbohydrates. Mesentericus forms decomposed different proteins quickly, whereas cocci and short rods decomposed protein slowly. Species related to *B. mycoides* and *B. megatherium* decompose protein and carbohydrates quite rapidly.

Spring wheat production in Illinois, R. W. STARK (*Illinois Sta. Bul. 287 (1927), pp. 337–351, fig. 1*).—Although spring wheat is grown to a limited extent in all parts of the State, it is of importance only in northern and central Illinois. It has been found less profitable than corn and winter wheat but more gainful than oats. Tests at De Kalb and the station recommended the use of the Marquis variety, a 2-bu. acre rate, seeding in 4-in. rather than 8-in. drills, and planting March 1 or soon thereafter. While spring wheat may advantageously substitute for winter wheat when fall weather conditions prevent seeding the latter, it usually replaces oats and follows corn. If cornstalks have not been plowed under carefully spring wheat should be sown elsewhere to avoid wheat scab. Preparation and seeding practices are outlined, and the characteristics and behavior of varieties tested are summarized.

The influence of certain soil amendments upon the quality of soft red winter wheat in Ohio, L. E. THATCHER (*Jour. Amer. Soc. Agron., 18 (1926), No 8, pp. 629–648, figs. 3*).—When sodium nitrate was applied to Dawson Golden Chaff wheat at monthly intervals from March 15 to June 15 at the Ohio Experiment Station, the straw yield and number of tillers per plat and the total nitrogen removal per plat in the crop were greater as the applications were made earlier in the season. The grain to straw ratio decreased with the later applications. Very little effect was noted on protein content of grain.

In a 5-year rotation fertility test, the 10-year average test weight per bushel was lowest on untreated plats and on plats receiving sodium nitrate alone.

Phosphorus alone and potassium alone gave consistently heavier wheat than nitrogen alone. The test weight was lowered when nitrogen was added to either phosphorus or potassium and raised when nitrogen was added to phosphorus with potassium. The effect of liming the land upon test weight and straw to grain ratio seemed to be correlated with seasonal conditions. Milling and baking records, together with protein and ash determinations, on wheat from the 1925 crop on these plats are tabulated and discussed.

[The Swedish State Seed Testing Station], H. WITTE (*Meddel. Statens Cent. Frökontrollanst. [Sweden], No. 1, (1926), pp. 1–38, figs. 7; Eng. abs., pp. 37, 38*).—An account is given of the history and organization of this station, its equipment, and its activities during the fiscal year 1924–25.

Recent Indiana weeds, 1925, A. A. HANSEN (*Ind. Acad. Sci. Proc., 41 (1925), pp. 199, 200*).—Plants reported as recently occurring in Indiana since the previous report (E. S. R., 55, p. 740) include fitsroot (*Astragalus glycophyllos*), Japanese bindweed (*Convolvulus japonicus*), Canada thistle, wild marigold (*Matricaria matricarioides*), stinking goosefoot (*Chenopodium vulvaria*), and wood sage (*Teucrium canadense*). Infestations of prairie mimosa (*Acuan illinoensis*), Bermuda grass, and perennial sow thistle are also noted.

Weed control, H. GROH (*Canada Expt. Farms, Div. Bot. Rpt. 1925, pp. 19, 20*).—Further experiments (E. S. R., 54, p. 834) indicated that moderately deep plowing followed by disking may be recommended for mouse-ear hawkweed as for other hawkweeds. Eradication without breaking up was tried by using dry salt with scattered patches, but recovery from the roots was prevented only with considerable injury to the grass. Common mouse-ear chickweed may be controlled in lawns by raking out the weed and then seeding in fresh grass.

The distribution of weed rye (Secale cereale) in the mountains of central Asia [trans. title], G. A. BALABAEV (BALABAJEV) (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant-Breeding), 16 (1926), No. 4, pp. 101–134, figs. 2; Eng. abs., pp. 132–134*).—Intensive studies in the mountainous districts of Samarkand established a definite regularity in the distribution of weeds, especially rye, according to the mountain zones. A tough-spiked winter rye, met with only in cereal fields, was noted chiefly in irrigated winter wheat, less frequently in winter barley, and rarely among spring grains on nonirrigated land or among other field crops. The spread of rye increases according to altitude, and in the mountain zones (1,330 to 2,440 meters) wheat is entirely supplanted.

HORTICULTURE

Methods of interpreting results of horticultural experiments, R. D. ANTHONY (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 256–258*).—A brief contribution pointing out the importance of determining the influence of individual variation where the number of individuals is small, and discussing also the application of the Mitchell and Grindley and Bessel formulas and the Student method for analyzing the results of horticultural investigations.

Effect of various lengths of day on development and chemical composition of some horticultural plants, E. C. AUCHTER and C. P. HARLEY (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 199–214*).—In studies at the University of Maryland of the effect of modifying the length of light exposure upon soy beans, peppers, lettuce, and radishes grown under high and low nitrate conditions, the soy beans blossomed much earlier and the peppers considerably earlier under a shortened day. On the other hand, lettuce and radishes blossomed sooner under a lengthened day. In the case of soy beans, very little difference was noted in the response to light changes of the high and

low nitrogen series, a fact due probably to the leguminous nature of the soy bean. On the other hand, a lack of nitrates delayed blooming in peppers, lettuce, and radishes irrespective of the length of day.

Analyses of soy beans showed short-day plants at the time of blooming to have a higher percentage content of total carbohydrates than plants of other treatments. At the same time the percentage of total nitrogen was lower. The normal-day plants reached a similar composition at blossoming time (86 days). Plants subjected to intermittent light failed to respond in the same way as plants receiving an equal amount of light in a continuous application. In the case of soy beans, intermittent-light plants at the time of blooming were low in sugars, starches, and soluble nitrogen and high in insoluble nitrogen. Soy beans lighted at night with electricity did not bloom in 160 days, the duration of the study. Since the percentages of soluble carbohydrates were somewhat lower in the continuous-light series, the authors deem it likely that the carbohydrates were used in growth extension rather than in fruiting.

[Breeding work at the South Dakota Station], N. E. HANSEN (*South Dakota Sta. Rpt. 1926, pp. 28–31*).—This comprises brief notes upon various breeding activities and the resulting seedlings, including pears, grapes, crab apples, walnuts, and roses. In general, homozygous parents have been found more valuable than heterozygous in the development of valuable seedling fruits.

Fertilizer experiments with greenhouse lettuce and tomatoes, J. W. LLOYD (*Illinois Sta. Bul. 286 (1927), pp. 309–336, figs. 3*).—A report upon greenhouse experiments with soils and fertilizers for lettuce and tomatoes.

A soil mixture made up of 4 parts brown silt loam, 2 parts rotted manure, and 1 part sand when supplemented with nitrate of soda at the rate of 0.86 lb. per 100 sq. ft. or dried blood at the rate of 3.96 lbs. per 100 sq. ft. produced better average yields of lettuce and equally as good crops of tomatoes as a soil mixture made up of 4 parts of soil, 4 parts of rotted manure, and 1 part sand, thus indicating that part of the manure might be effectively replaced by commercial fertilizers. The addition of acid phosphate to the nitrate of soda reduced the yields of lettuce and increased those of tomatoes. This detrimental effect upon lettuce was overcome by liming. Potassium sulfate proved of no value to lettuce and only slightly beneficial to the tomatoes when used in connection with other materials. Excessive quantities of commercial fertilizers had a tendency to reduce the yields of both the lettuce and the tomatoes.

Steam sterilization increased the yields of lettuce and decreased the yields of tomatoes growing in the 4–4–1 soil mixture. Sterilization apparently rendered the soil nutrients more quickly available, thus resulting in an exhaustion of the soil earlier in the season. In respect to the use of acid phosphate, the author suggests that none be used upon the lettuce but that small quantities be applied as a top-dressing to the tomatoes after the last crop of lettuce has been harvested.

A case of arsenical injury to tomato plants, F. A. FENTON (*Iowa Acad. Sci. Proc., 31 (1924), pp. 135–137, figs. 4*).—Bran mash poisoned with Paris green and used as a bait for cutworms is believed to have caused the death of tomato plants about whose bases it was placed. The death apparently resulted from girdling lesions caused by water-soluble arsenic.

Trials with commercial varieties of canning peas, A. N. HUME (*South Dakota Sta. Bul. 221 (1927), pp. 15, figs. 2*).—Herein are presented the results of a test of 10 commercial strains of 8 varieties of canning peas, supplemented

with general information upon culture, inoculation, canning factory operations, etc. Data upon the comparative yields of inoculated and uninoculated seed gave conflicting results, distinct increases being obtained from inoculation in only 5 of 11 trials. However, averaging all strains, inoculation increased the yield 5.96 per cent and the weight of green vines 23.7 per cent.

Watermelon culture, M. F. Wharton (*Arizona Sta. Timely Hints for Farmers, No. 156 (1926), pp. 7, figs. 4*).—This comprises general cultural information.

Essentials to successful fruit culture in Arizona, F. J. Crider (*Arizona Sta. Bul. 117 (1926), pp. 337–395, pl. 1, figs. 20*).—General information is presented upon fruits and varieties of fruits suited to different elevations and suggestions are given upon the soil requirements, planning and planting of the orchard, the use of filler trees, care of the orchard, dry land operations, general outlook of the fruit industry in Arizona, etc.

Fruit bud formation and growth, H. D. Hooker (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 123–126*).—Emphasizing the close association of carbohydrate accumulation with the rest period and fruit-bud differentiation in pome fruits, the author suggests that shoot growth is determined by a series of consecutive, reversible chemical reactions, in which an accumulation of end products such as carbohydrates retards and eventually stops the reaction. On the other hand, carbohydrate accumulation is not an end product of root activity and hence does not retard development. It is deemed likely that the accumulation of carbohydrates in the vicinity of the buds at time of differentiation may affect the morphological development of the growing point in such a way as to suppress the development of photosynthetic machinery and so favor the formation of floral parts.

Comparative rates of imbibition in apple wood tissue, C. F. Rogers (*Iowa Acad. Sci. Proc., 31 (1924), p. 134*).—Observations upon finely ground, air-dry wood of 12 apple varieties placed in a saturated atmosphere at a constant temperature showed the maximum rate and the greatest total imbibition in those varieties which have proved to be least hardy in Iowa.

The chemical composition of developing flowers and young fruits from weak and vigorous spurs of the apple, F. S. Howlett (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 194–199*).—Analyses, at the Ohio Experiment Station, of flowers collected from weak and vigorous Fall Pippin apple spurs at the time the central flowers were about to open showed, despite the fact of the reduced weight of the weak-spur blooms, no significant differences in the percentage composition of the two groups whether computed on the basis of green or dry weight. However, the average total amounts of nitrogen, free reducing substances, total sugars, and acid hydrolyzable polysaccharides were greater in flowers from vigorous spurs. The same relations held in flowers gathered just after the petals had fallen. Analyses of flowers collected from the same trees at the time abscission had begun showed higher nitrogen and lower free reducing substances and total sugars in the flowers which remained upon the tree, thus bearing out very closely previously noted results with Roxbury Russet flowers (E. S. R., 50, p. 835).

A comparison of the composition of flowers about to abscise with that of flowers from which the petals had just fallen showed no significant increases in total nitrogen and carbohydrates. Assuming equal pollination for blooms on strong and weak spurs, the author believes that many of the latter are incapable of fertilization from the beginning, due to some unknown cause such as egg cell degeneration or inadequate nutrition.

Some observations on the effect of inbreeding on the vigor of apple seedlings, H. L. Lantz (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 115–123*).—

Apple breeding studies at the Iowa Experiment Station have shown that inbreeding is not only difficult but usually results in seeds of fair to poor viability and trees low in vitality. Sib and back crosses, though accomplished quite easily, also yielded seedlings showing in the main lower vigor than those of out crosses. Two combinations, viz, Salome × Jonathan and McIntosh × Longfield, have been especially productive of valuable progeny. Results of sib and back crosses in these two lines are discussed in some detail.

Apple stock variation and its relation to scion growth, J. T. Bregger (*Amer. Soc. Hort. Sci. Proc., 21 (1924), pp. 313–318*).—Measurements taken at Cornell University of the initial growth of McIntosh and Rhode Island scions grafted upon equal sized root pieces taken from pairs of 6-year-old McIntosh trees which had received identical soil treatment but differed significantly in size showed a greater growth in progeny of large sized trees in 11 out of 14 pairs. The differences proved statistically significant, the odds in one case being equivalent to five times the probable error.

In a second experiment in which Delicious scions were grafted upon large and small sized apple seedlings, measurements taken of the first summer's growth revealed no significant differences which could be correlated with the sizes of the original seedlings. This fact is believed to indicate that factors which affect the initial growth of the scion do not influence its further development. Furthermore differences in seedling size may be due in part to differences in the time of seed germination.

The relation of temperature to pollen tube growth in vitro, H. E. Knowlton and H. P. Sevy (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 110–115, figs. 3*).—Studies at the West Virginia Experiment Station with the pollen of a number of varieties of apples placed upon agar medium containing 10 per cent cane sugar and held at various temperatures from 32 to 97° F. showed the greatest growth rate for all varieties except Yellow Transparent to be between 65 and 70°. Except at the lower ranges, temperature had no effect on the percentage of germination. The rate of growth of Rhode Island pollen was conspicuously slower than that of other varieties. In the case of Stayman Winesap and Arkansas pollen germination was so poor that no typical growth curves could be determined. Pollen held at low temperatures with little or no growth behaved normally when removed to a satisfactory temperature, but cultures taken from above the optimum temperature and placed at the optimum failed to recover. Practical deductions are set forth.

The causes and results of partial pollen sterility in apples and pears [trans. title], F. Kobel (*Landw. Jahrb. Schweiz, 40 (1926), No. 3, pp. 441–462, fig. 1*).—A further report (E. S. R., 52, p. 739) upon pollination studies at the horticultural experimental station at Wädenswil, Switzerland.

Continuation of pollen viability tests showed slight fluctuations from previous results, leading the author to suggest that viability of pollen is apparently influenced to a limited degree by internal and external nutritive conditions. Pollination tests with high and low viability varieties again demonstrated that varieties with low pollen viability are not good pollinizers. Cytological studies showed varieties with normal, odd number, triploid, and tetraploid chromosomes. The viability of the pollen was closely related to chromosome constitution; the greater the abnormalities, the lower the viability of the pollen grains. The haploid number was 16. Berner-Rosenapfel with a pollen germination of 97 per cent had 16 chromosome pairs, which behaved normally in the various divisions of the pollen mother cell. On the other hand, Gravenstein with a 7 per cent viability had 48 instead of 32 chromosomes in the somatic cells. William Christbirne (Bartlett) with 46 per cent viability had 16 pairs and 2 odd chromosomes.

Varieties with poorly germinating pollen bore fruits with many sterile seeds, a condition traceable to the abnormal chromosome constitution. Varieties with above the normal number of chromosomes inclined to parthenocarpy. A statistical analysis shows that under otherwise normal conditions the average fruit weight increased with an increasing seed number. In ripe fruits of two pear varieties an increase in the number of seeds per fruit was found to be accompanied by an increase in sugars and total acids. This phenomenon did not occur in apples, but there was noted a distinct rise in sugar content as the weight of the fruit increased.

Pectic constituents of peaches and their relation to softening of the fruit, C. O. Appleman and C. M. Conrad (*Maryland Sta. Bul. 283 (1926), pp. 8, figs. 3*).—Analyses of the fresh pulp of Crawford peaches harvested at various stages of maturity failed to reveal any pectic acid or pectates. Determinations of protopectin and soluble pectin in fruits picked hard ripe and allowed to soften in a room averaging 65° F. showed a close inverse relationship between the contents of the two substances. As soluble pectin increased the amount of protopectin showed a corresponding decrease. The maximum soluble pectin content was found in fully ripe fruits. The sum of the pectin and the protopectin apparently increased slightly as the fruits softened. The pectic changes in fruits stored at 37.5° was much slower than that of higher temperatures.

Fruits removed from the tree in the hard ripe stage and stored at 37.6° and those allowed to remain on the tree showed no increase in soluble pectin at the end of 3 days, whereas a comparable lot stored at 72° showed decided changes. The fruits at 72° became very soft, indicating a close parallel between softening and pectic changes. Similar results were obtained in a comparable experiment with greener peaches. Storage at low temperatures was found detrimental to quality, and it is deemed advisable to leave hard ripe peaches on the tree for a few days if marketing conditions are unfavorable.

The influence of potash upon the yield and quality of grapes [trans. title], C. Dusserre and C. Godet (*Ann. Agr. Suisse, 26 (1925), No. 5, pp. 639–643*).—Data obtained in a Chasselas vineyard located on the gravelly calcareous soil at the viticultural station at Auvernier show that potash fertilizers significantly increased yields, the average yield per vine for three years being 574, 654, and 699 gm. for the control, potassium sulfate, and potassium muriate plats, respectively. At the same time the sugar produced per acre was considerably greater on the potash plats, especially the muriate of potash plat.

Correlation of chemical composition with hardiness in brambles, R. V. Lott (*Missouri Sta. Research Bul. 95 (1926), pp. 22, figs. 4*).—A close correlation was found between the amount of actual winter injury in blackberries growing at Turner Station on a rather poor loess soil and the percentage of freezable water in the bark of lateral shoots, as determined by the dilatometer. Comparing the effect of four cultural treatments, namely, cover crop with and without nitrate of soda and ordinary culture with and without nitrate of soda, the least injury was found upon the cover crop and nitrate plat. This increase in hardiness is believed due to the stimulation of the nitrogen upon the cover crop which in turn was better able to use more of the soil moisture otherwise available to the blackberries. Determinations showed the highest percentages of bound water in the cover crop-nitrate plants. In the case of raspberries grown in the same vicinity, cover crops without added fertility increased hardiness.

The study of bark samples taken from raspberries growing at Columbia, part of which had the young shoots removed twice in early spring, showed the highest percentage of bound water and the least amount of killing in the

treated plants. The largest percentage of bound water, of pectin, and of protein nitrogen found in any bush fruits was in 2-year-old currants grown under ordinary culture. An evident correlation was noted between hardiness as measured by the percentage of bound water and the percentages of pectin and protein nitrogen. The correlation coefficients were 0.67±0.06 and 0.6±0.07, respectively. No relation was observed between hardiness and total sugars or total pentosans and only a slight correlation between hardiness and the percentage of dry weight.

Unlike the raspberry, the blackberry samples showed no seasonal development in pectin and bound water, suggesting that the blackberry probably attains its maximum hardiness earlier than does the raspberry. In the raspberry the seasonal increases in the percentages of bound water and pectin were particularly marked in those plants which had the first two crops of shoots removed.

The avocado stock problem, H. J. WEBBER (*Calif. Avocado Assoc. Ann. Rpt. 1925–1926, pp. 37–41*).—Citing the present day use of untested Mexican avocado seedlings as stocks for improved varieties, the author points out the advantages of using known seedlings of proved value both in respect to soil adaptability and effect upon the scion.

***Results of pollination and other experiments on avocados at the* orchards of the Point Loma Homestead**, O. I. and A. B. CLARK (*Calif. Avocado Assoc. Ann Rpt. 1925–1926, pp. 85–94*).—Avocado trees responded quickly to nitrogen applications either in the form of nitrate of soda or of ammonium sulfate provided they had not reached a critical stage of undernourishment when treated. Attempts to increase the set of fruit with nitrogen yielded negative results. A combination of animal and chemical fertilizers gave very good results.

In reporting further (E. S. R., 52, p. 343) upon pollination tests, the authors found no loss in fruit setting in the Fuerte variety when half the tree was inclosed in a tent which excluded practically all insects. The inclosure of portions of Fuerte and Spinks trees in a single tent with bees resulted in practically no set of fruit. Comparing cross- and self-pollination on the Dickinson variety, cross-pollination was invariably much more successful in producing fruits.

The citrus industry in South Africa, H. J. WEBBER (*Citrus Leaves, 6 (1926), No. 9, pp. 4–8, figs. 4*).—This contribution from the Citrus Experiment Station, Riverside, Calif., is a general discussion pointing out the present extent and distribution of the citrus industry in South Africa, together with comments upon its condition and future outlook.

Orange cincturing and root pruning tests, C. G. SAVAGE (*So. Aust. Min. Agr. Rpt. 1925, p. 36*).—Based on records taken at the State Experiment Orchard, Berri, South Australia, orange trees girdled in 1923 when in full bloom yielded 259 lbs. of fruit per tree, as compared with 185 lbs. for trees girdled when the new growth had just started and an average of 30 lbs. for untreated trees. Root pruning, on the other hand, had but slight effect upon yields, and the trees treated in this manner were for some time following sickly in appearance. Data taken the succeeding season upon the same trees without further treatment showed 129 lbs. of fruit for trees originally girdled when in full bloom as compared with 76 lbs. for those treated at the time new growth was starting. Root-pruned trees, on the contrary, yielded much larger crops the year following the treatment.

Studies in the Kao Pan Siamese seedless pomelo [trans. title], T. TANAKA (*Nôgaku Kwaihô (Jour. Sci. Agr. Soc. [Japan]), No. 275 (1925), pp. 288–299,*

pls. 3, figs. 2; Eng. abs., pp. 12, 13).—Brief descriptive notes are presented upon the fruits of the Kao Pan seedless pomelo, imported directly from Siam, the native habitat of the tree. The adaptability of this highly esteemed variety to various citrus-growing regions of Japan is also briefly considered.

Pollination of feijoas, O. I. Clark (*Calif. Avocado Assoc. Ann. Rpt. 1925–1926, pp. 94, 95*).—Covered and uncovered feijoa blossoms produced 9 and 40 per cent of fruits, respectively. No insect save the honey bee was seen to visit the blooms. Hand pollination tests showed the Coolidge variety to be 100 per cent self-fertile, and of many tested this was the most productive and bore the largest and best quality fruits.

The effective use of flowering plants, A. Ernst (*Die Zweckmässige Verwendung der Blütenstauden. Möhringen-Stuttgart: [Author], 1926, pp. [4]+108 pls. 20, figs. 16*).—Practical information is offered upon the planning and planting of flower gardens, with notes on the adaptability of various plants for special locations.

Improving small home grounds in Illinois (*Illinois [Sta.] Circ. 314 (1927), pp. 40, figs. 15*).—This includes information of a general nature concerning the planning and planting of home grounds, with notes upon garden fencing and furnishings, upon the preparation and care of the lawn, and upon trees, shrubs, and other smaller perennials.

FORESTRY

The new book of trees, M. Woodward (*London: A. M. Philpot [1926], pp. 310 figs. 91*).—This book contains popular descriptions and indicates the principal characteristic features of native and exotic trees of Great Britain.

Acacia seedlings, Part XI, R. H. Cambage (*Roy. Soc. N. S. Wales, Jour. and Proc., 59 (1925), pp. 230–248, pls. 5*).—Technical descriptions are given of the seedlings of several Acacia species, with notes on the nocturnal movement of early leaves and the closing of cotyledons at night.

Forestry legislative survey (*Washington, D. C.: Amer. Tree Assoc., 1927, pp. 67*).—A résumé of forestry organizations and activities in the various States.

Some aspects of forestry in South Australia, D. Mawson (*[Adelaide]: Univ. Adelaide, 1925, pp. [1]+30*).—A general statement upon the forestry situation in South Australia.

The line-plot system: Its use and application, W. M. Robertson (*Jour. Forestry, 25 (1927), No. 2, pp. 157–163*).—On the assumption that a large number of small plats evenly distributed throughout the area will yield more accurate information for the whole forest than will a few large sample plats, a line plat system was devised wherein records were taken upon small permanent sample plats spaced regularly along blazed perpendiculars run off at regular intervals from a permanent base line. Such a system offers the added advantage that it lends itself readily to statistical analysis, formulas for which are given in the text.

Accuracy of methods in estimating timber, R. H. Candy (*Jour. Forestry, 25 (1927), No. 2, pp. 164–169*).—Studies at the Petawawa Reserve and at the Lake Edward Forest Experiment Station, Quebec, of the line plat survey as a method for estimating timber showed that this method may be relied upon to give a sufficiently accurate estimate. Furthermore, this system had the great advantage of being susceptible to ready analysis concerning accuracy. Comparison between the strip and line plat methods showed much lower percentage of error in favor of the latter.

A new growth per cent formula, S. R. Gevorkiantz (*Jour. Forestry, 25 (1927), No. 1, pp. 44–49*).—Following a critical analysis of methods commonly

used in determining growth percentage, the author presents a new method devised by himself for deriving a growth percentage formula which he deems to be simpler than older formulas and to yield more accurate results.

The air seasoning of lumber in the Douglas fir region, H. H. JOHNSON and W. H. GIBBONS (*Timberman, 27 (1926), No. 12, pp. 38–41, figs. 14; 28 (1926), Nos. 1, pp. 38–41, figs. 14; 2, pp. 40–44, fig. 1; 28 (1927), No. 3, pp. 38–41, figs. 8*).—Herein are presented the results of an extended study of various practices in piling lumber in commercial establishments. With a view to outlining the most efficient and successful procedure, tables are included showing the amount and character of depreciation, and charts are given showing the rate of drying in different types of piling. Data are given upon the estimated time required to air season Douglas fir timber of various moisture contents.

Waste kauri wood as a source of paper pulp and resin (*Bul. Imp. Inst. [London], 24 (1926), No. 4, pp. 654–664*).—Tests conducted by the Imperial Institute, London, England, upon the properties of Kauri wood indicated that this could be converted into paper pulp of considerable value, whether in the original condition or following the removal of the resin. A large resin content reduced the yield of pulp so considerably that it is suggested that this substance might profitably be removed prior to pulping, especially when its content is more than 10 per cent. Preliminary studies upon resin extraction indicated that this material might be extracted from waste kauri wood at a reasonable profit.

DISEASES OF PLANTS

The relation of environment to disease in plants, L. R. JONES (*Amer. Jour. Bot., 11 (1924), No. 10, pp. 601–609, figs. 3*).—Holding that relatively less emphasis, in the stage attainable, should now be placed on the parasite as an independent organism and relatively more on the disease, the author urges as a first step increased attention to the relation between environment and disease inception and development.

Bibliography of the literature of plant protection, H. MORSTATT (*Biol. Reichsanst. Land u. Forstw. Berlin-Dahlem, Bibliog. Pflanzenschutzlit., 1925, pp. IV+228*).—The present issue covers the plant protection literature of 1925, retaining, in the main, the plan and features of the 1920 issue, previously noted (E. S. R., 50, p. 142).

Indiana plant diseases, 1923, M. W. GARDNER (*Ind. Acad. Sci. Proc., 40 (1924), pp. 297–313, figs. 3*).—This report is the fifth of this series (E. S. R., 55, p. 242). An acount of departures from normal temperatures and precipitations is followed by an account of economic diseases of plant hosts which are arranged alphabetically.

"The most destructive diseases noted this season were apple scab, blotch, fire blight, and bitter pit, cherry leaf spot, peach bacterial spot, plum brown rot, black raspberry anthracnose and leaf curl, and tomato leaf spot. Fire blight attracted the most attention.

"The diseases or parasites not previously recorded for the State were as follows: Apple, *Volutella fructi*, Alternaria core mold, and lenticel spot; Lima and sieva bean, *Bacterium vignae*; blackberry, mosaic; buckwheat, *Ramularia anomala*; Canadian bluegrass, *Ustilago striaeformis*; slippery elm, *Phyllosticta ulmicola*; hickory, *Mirostroma juglandis*; June grass, *Helminthosporium vagans*; mulberry, *B. mori*; peach, Rhizopus rot; petunia, mosaic;

Lombardy poplar, *Dothichiza populea*; raspberry, mosaic, leaf curl, eastern bluestem; rose, *Cylindrocladium scoparium*; snapdragon, *P. antirrhini*; sweet pea, *B. pisi;* soy bean, *Diaporthe sojae;* tobacco, *Cercospora nicotianae, B. tabacum;* tomato, Rhizoctonia soil rot. In an experimental plat, mosaic was noted on velvet bean, broad bean (*Vicia faba*), scarlet runner bean (*Phaseolus coccineus*), asparagus bean (*Vigna sesquipedalis*), and *V. catjang*."

Observations concerning the disease susceptibility of cereals and wild grasses, E. B. Mains (*Ind. Acad. Sci. Proc., 40 (1924), pp. 289–295, figs. 3*).—Several hosts and diseases are included in this report of observations.

Conditions for heat canker and sun scald in plants, R. B. Harvey (*Jour. Forestry, 23 (1925), No. 4, pp. 392–394*).—Heat cankers or sun scald injuries are due to excessive heat from the sun, conditions favoring scald being still, warm, cloudless days and dry soil. The injury may be decreased by shading, by increasing the soil moisture, and by keeping fruits as far above the soil as is practicable.

Mosaic and related diseases, L. O. Kunkel (*Amer. Jour. Bot., 12 (1925), No. 8, pp. 517–521*).—Beginning with the claim of Beijerinck published in 1899 (E. S. R., 11, pp. 167, 359) to have discovered in tobacco a contagious principle or agent causing the condition now widely known as mosaic, the author gives consideration to a few of the hypotheses regarding the character and causation of this condition.

Observations on the spore characters and histology of some physiological species of Puccinia graminis, K. C. Mehta (*Indian Sci. Cong. Proc. [Calcutta], 11 (1924), p. 138*).—An account is outlined of the infection histology of *P. graminis tritici* and *P. graminis secalis* as cultivated on wheat, barley, and rye.

Studies in the life history and physiology of certain smuts, G. B. Sartoris (*Amer. Jour. Bot., 11 (1924), No. 10, pp. 617–647, pls. 3*).—*Tilletia tritici, T. foetens, Ustilago tritici, U. hordei, U. zeae,* and *U. heufleri* were studied.

What is considered by the author as the oustanding result of his work is the evidence presented that *U. hordei, U. tritici,* and *U. heufleri* can complete their morphological life history saprophytically in artificial culture media. Among the findings or confirmations as summarized, it is stated that infection of wheat by *T. tritici* occurs from the time of germination until a few days after the germination of the wheat, as reported by others. The germ tube from the fused sporidia enters between the cells of the sheath leaf. It is very seldom that the germ tube is intracellular. The mycelium and secondary spores of *T. tritici* are not able to infect the host, at least at the time and place where infection occurs from the usual infection tube. The mycelium and resting spores of *U. zeae*, formed in culture, are not able to infect the host.

The toxicity of the spores of Tilletia tritici to animals, N. Dobson (*Brit. Mycol. Soc. Trans., 11 (1926), pt. 1–2, pp. 82–91*).—"From the point of view of the practical stock feeder, it may be safely accepted that grain infected with bunt [*T. tritici*] may be fed without injury to animals."

The relation of stinking smut virulence to soil character [trans. title], G. Gassner (*Angew. Bot., 7 (1925), No. 2, pp. 80–87*).—The alleged influence of soil character on the controllability of cereal stinking smut by seed steeping treatment, as appearing here in tabular and discussional detail, is typified by the fact that such plants succeeded better in sand than in garden soil.

Values in pickling media [trans. title], G. Gassner (*Angew. Bot., 6 (1924), No. 1, pp. 1–16*).—An attempt is made to adjust and judge seed treatments with regard to efficiency and safety.

Biological testing of seed treatments [trans. title], G. FRIEDRICHS (*Angew. Bot., 7 (1925), No. 1, pp. 1–9, figs. 2*).—Seed treatment data are given for Kalimat, Germisan, and Uspulun.

Dust fungicides in Hungary, 1921–1924 [trans. title], H. KERN (*Angew. Bot., 7 (1925), No. 1, pp. 19–24*).—Advantages or disadvantages of different dusts are briefly indicated.

Preliminary studies on Pleosphaerulina briosiana, J. H. MILLER (*Amer. Jour. Bot., 12 (1925), No. 4, pp. 224–237, pl. 1, figs. 7*).—Having noted characteristic spots, not accounted for by known parasites, on alfalfa and related plants in 1922, and having later identified a causal organism as *P. briosiana*, first noticed in Europe by Pollacci (E. S. R., 14, p. 159) as causing a leaf spot on alfalfa in Italy, the author gives an account of this fungus in this connection, stating that the fungus collected here is identical with that described by Pollacci except as to the color of the ascospores.

It is stated that *P. briosiana* is not parasitic on alfalfa, the spots being made by an insect which is followed saprophytically by the fungus, and that the fungus confines itself to the spot unless the resistance of the leaflet is broken down by many insect attacks. The fungus spreads to young plants after a cutting by ejection of the ascospores from perithecia on leaves lying on the ground. The method of spread to new fields is not known.

Cabbage diseases in Indiana, C. T. GREGORY (*Ind. Acad. Sci. Proc., 40 (1924), pp. 283, 284*).—This deals with cabbage yellows, blackleg, and a seed stalk rot.

Corn ear rot, A. N. HUME (*South Dakota Sta. Rpt. 1926, p. 9*).—The author reports having produced from selections of the previous year about 100 separate strains of corn, and that they have been found to possess several heritable characters peculiar to strains of such corn. These characters include chlorophyll deficiency, rolled top, leaning tops, striped leaves, etc. Two molds (*Aspergillus niger* and *Fusarium moniliforme*) were isolated from strains of corn included in this study. An attempt was made to associate disease organisms with the development of supposedly heritable characters, and it is said that there is no reason to doubt that the organisms associated with corn diseases reduce the percentage of germination, usually interfere with growth, and seem to be associated with peculiarities of growth which may also be heritable.

***The transmission of streak disease of maize by the leafhopper* Balclutha mbila Naude**, H. H. STOREY (*Ann. Appl. Biol., 12 (1925), No. 4, pp. 422–439, pls. 3*).—A streak disease of sugar cane, maize, and related grasses is said to have been originally indicated by Fuller (E. S. R., 13, p. 1062). This has been variously noted and has been described by the present author (E. S. R., 54, pp. 246, 250, 251), and the suggestion has been offered that this is a specific transmissible disease to be associated with others known to be of the mosaic type. Complete confirmation of the views of the present author had not then been obtained.

The present paper records experimentation in which the transmission of the disease was effected through the agency of a jassid leafhopper, *B. mbila*, the controls remaining healthy. In experiments in which individuals of *B. mbila* collected upon streak diseased maize were allowed to feed on single leaves of the experimental plants the disease resulted in 45 out of 48 plants. One jassid lived for 5 months and carried the disease to 8 separate plants. No loss of infective power occurred in any jassid tested, even in periods of starvation in some cases or of feeding on apparently immune plants in others. Certain individuals, collected upon streaked maize, were incapable of causing any infection under similar conditions. Jassids reared upon healthy maize

could not infect plants with streak disease, but after feeding upon diseased leaves for a week 26 per cent of the males and 86 per cent of the females, out of a total of 62 individuals, became infective. Negative results were obtained with *Aphis maidis*, *Peregrinus maidis*, and a number of undetermined jassids and fulgorids. Field observations showed that *B. mbila* was to be found whenever a field of maize recently infected with streak disease was thoroughly searched. It is therefore held to be the agent of spread of this disease in the field.

The testing of new varieties of hops, R. G. HATTON and J. AMOS (*East Malling* [*Kent*] *Research Sta. Ann. Rpt. 1924, pp. 169–175*).—In a portion of this account of the testing of new varieties of hops, reference is made to hop downy mildew and incidence of mosaic in the hop garden.

Physiologic races of oat smuts, G. M. REED (*Amer. Jour. Bot., 11 (1924), No. 7, pp. 483–492, figs. 3*).—A summary of information to 1918 (E. S. R., 41, p. 152) and of later more or less related investigations by the author (E. S. R., 44, p. 747; 54, p. 250) has been followed up with an account of experimentation started in the greenhouse under controlled conditions in 1924. The data as tabulated or detailed and discussed show differences, which are not necessarily more distinct when widely separated geographically (Wales and Missouri) than when taken from the same locality or field.

The conditions of infection in potato wart, F. WEISS (*Amer. Jour. Bot., 12 (1925), No. 7, pp. 413–443, pls. 4, figs. 3*).—*Synchytrium endobioticum* is an obligate parasite, the only part or phase of its life cycle which is independent of a living host being that during the germination of the resting and soral sporangia and ensuing swarm period of the zoospores, which lasts only an hour or two. Studies here indicated show that the infection by *S. endobioticum* is dependent on the presence of particular varieties of its host and on environmental conditions in general favorable to vigorous growth of the potato plant. Germination of both resting and soral sporangia occurs in water, and there is an indispensable minimum of water for the distribution of the motile cells. Other conditions are indicated.

Although the potato wart fungus and the potato plant have similar requirements as to environmental factors, the disease can not spread widely under an effective quarantine on the movement of infected seed. Its controllability through the use of immune varieties tends to reduce it, in the United States, to a problem the solution of which is at hand.

The Helminthosporium disease of rice occurring in the southern United States and in the Philippines, G. O. OCFEMIA (*Amer. Jour. Bot., 11 (1924), No. 6, pp. 385–408, pls. 6*).—In an account previously noted (E. S. R., 50, p. 654), the author called this disease sesame spot of rice. The name is in the present article, as previously (E. S. R., 53, p. 853), expressly changed to Helminthosporium disease of rice, to make it distinctly a disease of rice and to avoid possible confusion with the Helminthosporium disease of *Sesamum indicum* caused by *H. sesameum*, which is said to be widely distributed in the Philippines.

The Helminthosporium disease of rice occurs in Java, Sumatra, Japan, China, India, Straits and Federated Malay States, Italy, the Philippine Islands, and Louisiana. It is primarily a seed bed disease arising from the planting of infected grains. Its severity varies in different places, probably on account of climatic conditions, losses among seedlings in the Philippines ranging from 10 to 58 per cent. In Louisiana no actual count was made. It appears to attack all cultivated rice varieties. The effects are described. The cause is *H. oryzae*, different strains existing as shown by morphological

and physiological differences. The fungus overwinters as dormant mycelium, the hyphae being responsible for the greater part of the primary infection in the field. *H. oryzae* is not known to produce the perfect stage. Conidia are wind borne, causing secondary infection. The fungus is pathogenic on other grasses. Infection from the overwintered fungus may be reduced or prevented by submerging the soil in water at from 24 to 28° C. (75.2 to 82.4° F.) to a depth of about 10 cm. (4 in.) Lowland rice varieties emerged through water 10 to 20 cm. deep, and the conidia mixed with the soil at planting or suspended in the water did not produce infection.

The relation of soil temperature to germination of certain Philippine upland and lowland varieties of rice and infection by the Helminthosporium disease, G. O. Ocfemia (*Amer. Jour. Bot., 11 (1924), No. 7, pp. 437–460, pls. 4*).—Rice Helminthosporium disease (*H. oryzae*) (see above) is said to be of considerable economic importance, unfavorable weather conditions promoting a serious seedling blight of rice on seed beds and in fields. Seedling infection is due mainly to seed-borne mycelium, though conidia or mycelium overwintered in soil or crop residues may cause some infection.

The present work included experiments to determine the effects of soil temperatures, moistures, and sterilization. Temperatnres favorable to growth and sporulation of *H. oryzae* are about the same as those for the development of the Philippine varieties of rice. Severe infection occurs at temperatures of from 16 to 24° C. (60.8 to 75.2° F.), which may blight the seedlings before they emerge, whereas at 36° only occasional blighting occurs. Planting in soil or beds at from 32 to 36° materially reduces infection. Coleoptile, mesocotyl, and seedling-root infections and resulting lesions, though more abundant and rapid in developing at higher soil temperatures, are less harmful and are outgrown. At lower soil temperatures, even coleoptile, mesocotyl, and seedling-root infections are conducive to blighting after the seedlings have emerged through the soil.

A note on the sterilization of rice-grains, S. R. Bose (*Indian Sci. Cong. Proc. [Calcutta], 11 (1924), p. 143*).—*Bacillus subtilis* in its sporing forms is common on rice grains, other seeds, and fruits. These forms are very resistant, but can be rendered harmless by dipping in 0.1 per cent mercuric chloride solution for from 4 to 6 minutes. The poison apparently does not penetrate the seed.

Puccinia coronifera on winter rye [trans. title], L. F. Russakow (*Angew. Bot., 7 (1925), No. 4, pp. 262–266*).—In the autumn of 1924 an outbreak of *P. coronifera* on winter rye occurred in the neighborhood of Kamennaja Steppe, Voronezh Province, Russia, exceeding in severity the attacks by *P. dispersa* and *P. graminis*. The teleutospore stage of *P. coronifera* was unusually abundant, constituting about 85 per cent of all cases of infection. This is thought to be connected with the unusual dryness of the autumn weather.

Solanaceae as hosts for Synchytrium endobioticum [trans. title], F. Esmarch (*Angew. Bot., 7 (1925), No. 2, pp. 108–120, figs. 6*).—A study is reported, with short bibliography, of the potato wart organism, *S. endobioticum*, on various members of the nightshade family.

Influence of environal factors on the infection of sorghums and oats by smuts, I, II, G. M. Reed and J. A. Faris (*Amer. Jour. Bot., 11 (1924), Nos. 8, pp. 518–534, figs. 7; 9, pp. 579–599, figs. 3*).—The experiments described in part 1 were undertaken to determine the relation of soil factors, such as temperature, moisture, and reaction, to infection of sorghums by *Sphacelotheca sorghi* and *S. cruenta* and of oats by *Ustilago levis*. Results with the two sorghum smuts, which are the chief matters dealt with in this section, show that they respond

in quite similar fashion to temperature, moisture, and reaction as regards infection of susceptible varieties by *S. sorghi* and *S. cruenta*. Slightly acid soils favor high infection percentages. A wide temperature range as regards infection was established. The same was true of moistures, though the lower moistures greatly favored infection.

In part 2 the authors report a similar series of experiments on the infection of oats by *Ustilago levis*.

Of the two oat varieties used, *Avena nuda inermis* and *A. sativa victor*, the former became infected at all temperatures tested (6) from 5 to 30° C. with *U. levis*, the highest infection occurring at 25° (77° F.) *A. sativa victor* was also infected at all temperatures, but this consistently gave lower results than did *A. nuda inermis*, except at the highest temperature, 30°.

"Soil moisture, soil temperature, and soil reaction are interdependent factors. Their interaction determines whether infection will take place and also the severity of the attack. Any one of these factors may be a limiting one in the prevention of infection. The term 'optimum temperature for infection,' for example, is without significance unless due regard is paid to other possible influencing factors."

Cytological studies of the mosaic disease of tobacco, T. E. Rawlins and J. Johnson (*Amer. Jour. Bot., 12 (1925), No. 1, pp. 19–32, pl. 1*).—After careful study of about 345 slides showing the various stages of mosaic, the authors offer their interpretation of the evidence as to the cycle of development of the peculiar intracellular bodies found in mosaic tobacco leaves.

"The striate material, bodies of the small type, and the crescent-shaped bodies seem to be the first visible abnormalities to develop. All these bodies seem to appear at about the same stage in the development of the disease.

"The fact that the striate material is usually in contact with the nucleus during its early stages indicate that it may bear some rather close relation to the nucleus." Other facts cited are discussed. "With the exception of the striate material, all these types of abnormal intracellular bodies have shown a striking similarity in their staining reactions. While such similarity can not be considered proof of likeness in chemical nature, it is evidence of some value in that connection." With the exception of a type of abnormality indicated, "bodies of all the types described have been found in leaf cells containing mitotic figures. This fact is interesting in that it indicates that the presence of these bodies does not prevent what appears to be normal nuclear and cell division."

Acidity and varietal resistance of wheat to Tilletia tritici, A. M. Hurd-Karrer (*Amer. Jour. Bot., 12 (1925), No. 7, pp. 359–371*).—In former papers (E. S. R., 49, p. 245; 51, p. 651), the author claimed that varietal resistance of wheat to stem rust (*Puccinia graminis tritici*) was not correlated with either the titratable acid or the H-ion concentration of the expressed juice. In view of the reports of Von Kirchner (E. S. R., 35, p. 749; 42, p. 47) that susceptible wheat seedlings are less acid than are resistant plants, suggesting that high titratable-acid concentration is responsible for resistance, the author carried out a more exhaustive study of both the H-ion concentration and the titratable acidity of wheat varieties whose reactions to the smut organism ranged from extreme susceptibility to immunity, and the data obtained are recorded in this article.

The wheat varieties in the grouping characterized by low titratable acidity were Jones Fife, Hybrid 128, Jenkin, Martin, and (probably) White Winter. The high-acidity wheats were Hussar, White Odessa, Ridit, Florence, Little Club, and (probably) Banner Berkeley and Turkey (Washington 326).

The relatively low values for the immune Martin and the high values for the very susceptible Little Club are inconsistent with Von Kirchner's suggestion that high titratable acidity of the juice of wheat is responsible for resistance to *T. tritici*. Hybrid 128, Jenkin, and usually Jones Fife were characterized by relatively high H-ion concentrations, as was probably one other susceptible variety, White Winter, thus precluding the existence of a causal relation between a high concentration of hydrogen ions in the juice and resistance to *T. tritici*.

Breeding measures for control of loose and stinking smut of wheat [trans. title], G. SESSOUS (*Landw. Jahrb. Bayern, 15 (1925), No. 7–8, pp. 276–291*).—A comparative study of varietal resistance to wheat loose and stinking smut, as outlined, is discussed as to its bearings on the problem of protection against these two diseases.

The loose and stinking smuts in Indiana, C. T. GREGORY (*Ind. Acad. Sci. Proc., 40 (1924), pp. 285–288, fig. 1*).—The season of 1924 was exceptional in the general prevalence throughout Indiana of wheat loose smut, which caused losses twice as great as in the preceding year, the conditions lending unusual importance to the behavior of wheat from hot-water treated seed. Details and comparisons are given.

Field observations on the crown-gall of nursery stocks, H. WORMALD and N. H. GRUBB (*East Malling [Kent] Research Sta. Ann. Rpt. 1924, pp. 122–125*).—Observations are outlined as made on galls found on layered apple stocks. Similar outgrowths have been seen by the authors on crab stocks, layered pear stocks and young pear trees, layered hawthorn stocks, plum and cherry trees, raspberry, loganberry, mangel, beetroot, melon, hop, and hollyhock. While it is admitted to be generally recognized that crown gall is caused by *Bacterium tumefaciens*, it is not held that all galls in which no parasite is detected are due to this organism.

Of the apple stocks produced at East Malling, not one has proved to be wholly immune to crown gall. The size of the galls, however, may be somewhat influenced by the variety of the stock. Certain trees kept under observation for 5 years show that those bearing galls are not noticeably inferior to those having no galls. Experiments carried out on stocks raised from layers and stools, as summarized, indicate that cutting the shoots from the layers or stools with a knife is preferable to tearing them off, as the clean-cut surface is less favorable to gall development than a rough tear. Covering the cut surface at the lower end of the stocks with grafting wax or Stockholm tar reduces both number and size of the basal galls. Galls on the stem above the base and root galls may be largely prevented by careful handling and planting, so as to minimize injuries.

Field observations on the incidence of leaf scorch upon the apple, R. G. HATTON and N. H. GRUBB (*Jour. Pomol. and Hort. Sci., 4 (1925), No. 2, pp. 65–77; also in East Malling [Kent] Research Sta. Ann. Rpt. 1924, pp. 41–53*).—Observations covering 6 years have shown that the variety of rootstock influences strongly the development of leaf scorch. Among the layered stocks, three varieties, all classed as semidwarfing, have shown a notable tendency to increase the scorch. Among the seedling crab or free stocks, great variability is shown, but less tendency to scorch than is shown by semidwarfing varieties. These manifestations of varying susceptibility have been noted on the unworked stocks themselves and on very different types of soil. Different varieties show consistently different degrees of susceptibility. The order of susceptibility of the four varieties available for comparison proved to be identical on layered and seedling roots. Leader tipping tends to reduce scorch. A direct relationship

appears between blossoming and fruiting and leaf scorch, which may account for the effect as noted of leader tipping. Leaf scorch reduces directly the size of the fruit. In young trees, lack of organic manures accentuated scorch, though generous feeding of older trees with organic (predominantly nitrogenous) manures did not check the trouble.

An unusual form of pear canker, R. V. Harris (*East Malling* [*Kent*] *Research Sta. Ann. Rpt. 1924, pp. 135, 136, pl. 1*).—In 1924 the author observed an unusual form of canker on a trained pear tree at West Malling. This is described in connection with the fungus, *Nectria galligena*, the cause of apple and pear canker, and its Fusarium stage. It is not known whether previous infection by the scab fungus is necessary for the canker fungus to gain entrance in this particular form of infection.

The mulberry "blight" in Britain, H. Wormald (*Ann. Appl. Biol., 11* (*1924*), *No. 2, pp. 169–174, pl. 1*).—In Sussex and Kent a mulberry bacterial blight has been found on stools and on both young and well-established mulberry trees. The black lesions on the leaves proved to be due to the white organism identified as *Bacterium mori*, an associated yellow organism failing to reproduce any of the disease symptoms. A die-back of some of the material studied was associated with *Fusarium lateritium*.

Mulberry bacterial blight, H. Wormald (*East Malling* [*Kent*] *Research Sta. Ann. Rpt. 1924, pp. 120, 121*).—This brief account, referring to the more detailed one above noted, mentions the additional fact that another disease of mulberry leaves, which may easily be confused with that caused by *Bacterium mori*, is due to the fungus *Gibberella moricola*.

The blue stripe wilt of the raspberry, R. V. Harris (*East Malling* [*Kent*] *Research Sta. Ann. Rpt. 1924, pp. 126–134, pls. 3*).—A disease of cultivated raspberry, *Rubus idaeus*, is described as causing wilt of the canes, progressing upward, and eventuating in their death. The nature and extent of the damage to the crop is also discussed. Cultural work isolated a Verticillium, with marked constancy, from affected stools of many susceptible varieties. A controlled inoculation experiment, using plate cultures of the Verticillium from diseased canes, induced the disease with its characteristic field symptoms. It is proposed, for reasons stated, to designate this disease as the blue stripe wilt of raspberry.

Erysiphaceae croatiae, V. Škorić (*Glasnik Šumske Pokuse* (*Ann. Expt. Forest.*) [*R. Univ. Zagreb Inst. Expt. Forest.*], *1* (*1926*), *pp. 52–118, pls. 32; Eng. abs., pp. 108–111*).—This is a phytopathologic-systematic monograph on the powdery mildews of Croatia, with 110 references to the literature of the subject.

The cause of spike disease in sandal (Santalum album L.), P. S. Jivanna Rao (*Indian Sci. Cong. Proc.* [*Calcutta*], *11* (*1924*), *p. 149*).—A sandal tree about 10 years old was so trenched as to injure the roots of this tree and of its hosts. This resulted in the shortening of the leaves and in their accumulation of starch, apparently because of the limitation of the water supply. Want of good hosts (for example, shortness of their lives) is a limiting factor as regards the best growth of sandal. The welfare of the hosts thus appears to be of greater importance than the bestowal of care upon the parasite (*S. album*) itself.

The biology and pathology of some of the hardwood heart-rotting fungi, I, II, D. V. Baxter (*Amer. Jour. Bot., 12* (*1925*), *Nos. 8, pp. 529–552, pls. 3; 9, pp. 553–576, pl. 1*).—These two sections deal continuously with studies of wood-inhabiting fungi and their hosts, including *Polyporus hispidus* on *Fraxinus*

nigra; Fomes fraxinophilus on *Fraxinus americana; F. fraxinophilus ellisianus* on *Shepherdia argentea; F. applanatus* on *Morus rubra; F. connatus* on *Nyssa sylvatica* and *Acer rubrum; F. everhartii* on *Quercus velutina, Q. rubra*, and *Q. alba; F. igniarius* on *Fagus grandifolia; F. pomaceus crataegi* on *Prunus americana* and *Crataegus* sp.; also with studies in less detail of *F. conchatus* on *Fraxinus nigra* and *Crataegus* sp., and *Hydnum septentrionale* on *A. rubrum*.

The results of this study on the above heart-rotting fungi are said to show that visible changes in tree trunks or in wood generally referred to as decayed or as in an incipient stage of decay can not be used as a criterion of the extent to which the fungus has progressed in the apparently sound wood, that mycelium occurs in a radial or linear direction in advance of such visible decay to a considerable distance, and that mycelium grown on wood in the laboratory does not necessarily produce discolorations or other visible indications of rot in initial stages of decay. An improved method was used for the pure culture of wood-rotting fungi, the advantages of which are indicated. Six species were developed on artificial media or on wood blocks in flasks, namely, *Polyporus hispidus, Fomes igniarius, F. everhartii, F. fraxinophilus, F. fraxinophilus ellisianus*, and *F. pomaceus*, the latter three being studied in pure culture, it is said, for the first time. Each fungus on agar produced a luxuriant and distinctive vegetative growth. Decay rate of a given fungus depends upon the character of the wood. Field and culture study of *F. ellisianus* and *F. fraxinophilus* indicated that they should be considered as a single species. *F. ellisianus* is considered as a form of *F. fraxinophilus*.

Studies in wood decay.—III, The toxicity of western yellow pine crude oil to Lenzites sepiaria Fries, H. SCHMITZ (*Jour. Indus. and Engin. Chem., 14 (1922), No. 7, pp. 617, 618*).—Previous papers of this series have been noted (E. S. R., 48, pp. 352, 353). From this work it appears that western yellow pine oil has only very limited toxic properties and little value as a wood preservative against *L. sepiaria*, and also that its high rate of evaporation is a disadvantage. The toxic point (that at which growth of the fungus is completely inhibited) varied slightly with the kind of wood used (sawdust of lowland white fir, Douglas fir, and sugar maple).

Studies in wood decay, IV, V, H. SCHMITZ (*Amer. Jour. Bot., 11 (1924), No. 2, pp. 108–121, figs. 5; 12 (1925), No. 3, pp. 163–177, pls. 3*).—Part 4 of this series, entitled The Effect of Sodium Carbonate, Bicarbonate, Sulphate, and Chlorid on the Rate of Decay of Douglas Fir Sawdust Induced by *Lenzites sepiaria* Fr. with Special Reference to the Effect of Alkaline Soils on the Rate of Decay of Wood in Contact with Them, considers only the indirect effect upon wood of the salts making up the "alkali" of alkaline soils; that is, the effect of these salts on the rate of decay induced by wood-destroying fungi.

It is thought that small amounts of sodium carbonate or of sodium bicarbonate increase the rate of decay in Douglas fir sawdust as induced by *L. sepiaria*, and that this stimulation is augmented by certain proportions of sodium sulfate, the question of such influence due to sodium chloride being regarded as unsettled. It is also said that results, not here recorded, from a preliminary series of studies were comparable in every way to those indicated in this report.

In part 5, Physiological Specialization in *Fomes pinicola* Fr., the four strains studied were obtained by the tissue method from sporophores. The dead but still erect trees from which these strains were taken were Douglas fir (*Pseudotsuga taxifolia*), white fir (*Abies grandis*), western hemlock (*Tsuga heterophylla*), and western white pine (*Pinus monticola*), and the wood-destroying proclivities of these different strains were tested on *Pinus ponderosa* (heart-

wood and sapwood), *P. monticola* (heartwood), *Larix occidentalis* (heartwood), *Pseudotsuga taxifolia* (heartwood), *Abies grandis*, *T. heterophylla*, and *Picea engelmanni*. The percentages of weight loss are tabulated.

The results, while not conclusive, are regarded as sufficiently so to indicate that there may be considerable physiological variation within the species *F. pinicola*, though it is uncertain whether or not this may result from host influence. The data also indicate the desirability if not the necessity of considering the source of wood-destroying fungus cultures in experiments dealing with the decay of wood under laboratory conditions.

ECONOMIC ZOOLOGY—ENTOMOLOGY

A biological survey of North Dakota, I, II, V. BAILEY (*U. S. Dept. Agr., Bur. Biol. Survey, North Amer. Fauna No. 49 (1926), pp. VI+226, pls. 21 figs. 8*).—In part 1 of this report (pp. 1–16) the author considers the physiography and life zones of North Dakota, listing characteristic mammals, breeding birds, and plants, and crop adaptations of the Upper Austral, Transition, and Canadian zones. Part 2 (pp. 17–217) deals with the mammals of North Dakota, including an introductory part upon their present and former abundance, useful and harmful species, Indian names, and measurements and weights. Then follow accounts of the mammalian fauna, the type locality, general characters, early abundance, distribution, food and other habits, economic status, etc., so far as known. The bibliography which follows includes 70 titles.

Some habits of mountain lions in Arizona, M. E. MUSGRAVE (*Jour. Mammal., 7 (1926), No. 4, pp. 282–285*).—This is a brief account by an agent of the U. S. D. A. Bureau of Biological Survey of the habits of mountain lions, particularly as related to the securing of food—the capture of cattle, horses, deer, etc.

Anatomy of the wood rat, A. B. HOWELL (*Baltimore: Williams & Wilkins Co., 1926, pp. X+225, pls. 3, figs. 37*).—Following an introduction, the several chapters of this work deal with the systematic position of Neotoma and its subgenera (pp. 6, 7), habits of the three subgenera studied (pp. 8–10), external features (pp. 11–21), myology (pp. 22–89), alimentary tract and adjacent glands (pp. 90–99), urogenital system (pp. 100–109), osteology (pp. 110–172), and a discussion of muscle action and limb motion and of subgeneric variation (pp. 173–216). A bibliography of 39 titles is included.

A disease in wild rats caused by Pasteurella muricida n. sp., K. F. MEYER and A. P. BATCHELDER (*Jour. Infect. Diseases, 39 (1926), No. 5, pp. 386–412, fig. 1*).—A detailed pathologic, anatomic, and bacteriologic study of 88 wild rats caught in the course of plague-control work in Oakland and Alameda, Calif., has proved the existence of four rodent diseases, namely, hemorrhagic septicemia (pasteurella), plague, rat typhoid (due to *Bacillus enteritidis* and *B. paratyphosus* B), and pseudotuberculosis (due to *B. pseudotuberculosis rodentium* Pfeif.). The comparative anatomic findings and the significance of the diagnostic guinea pig inoculations and cultures are discussed.

"The causative organism of the hemorrhagic septicemia, for which the name *P. muricida* n. sp. is proposed, resembles morphologically, culturally, biochemically, and serologically the well-known representatives of the pasteurella group. It is highly pathogenic for guinea pigs, rabbits, mice, and white and gray rats. Barnyard birds and cats are refractory. A spontaneous epidemic among laboratory rats introduced by an animal experimentally infected by the nasal route is reported."

The storing habit of the Columbian ground squirrel, W. T. SHAW (*Amer. Nat., 60 (1926), No. 669, pp. 367–373*).—This contribution from the Washington Experiment Station is in continuation of investigations of this rodent (*Citellus columbianus columbianus*) previously noted (E. S. R., 56, p. 56).

Records of birds bred in captivity, E. HOPKINSON (*London: H. F. & G. Witherby, 1926, pp. IX+330*).—This is a compilation of records of the different species of birds that have been bred in captivity. Part 1 (pp. 1–174) deals with species which have bred in confinement, part 2 (pp. 175–264) with hybrids, and part 3 (pp. 265–314) consists of a summary of the records.

The distribution of bird-life in Ecuador: A contribution to a study of the origin of Andean bird-life, F. M. CHAPMAN (*Bul. Amer. Mus. Nat. Hist., 55 (1926), pp. XIII+784, pls. 30, figs. 21*).—This is a continuation of the biological survey of South America (E. S. R., 38, p. 761). In part 1 (pp. 3–133) the author gives a review of the history of Ecuadorean ornithology, and deals with the American Museum's expeditions, the general physiography of Ecuador, distribution of forests, general climatic conditions, life zones of Ecuador and their bird life, discontinuous ranges and their significance, and the zonal distribution by families. Part 2 consists chiefly of a distributional list of species and subspecies (pp. 145–702), preceded by brief remarks on the classification and nomenclature, the treatment of genera and of subspecies, the number of species included, lists of 86 Ecuadorean birds described as new, and of families with the number of species and subspecies by which each is represented in Ecuador, remarks upon and a list of North American migrants found in Ecuador, and a note upon the scope of data presented, and is followed by a gazetteer, bibliography of 13 pages, addenda, and an index.

Protozoology, C. M. WENYON (*London: Baillière, Tindall & Cox, 1926, vols. 1, pp. XVI+778, pls. 5, figs. 336; 2, pp. IX+779–1563, pls. 15, figs. 229*).—The several parts of this work are as follows: Part 1, a general description of the Protozoa (pp. 1–152); part 2 (in both volumes), a systematic description of the Protozoa, with special reference to parasitic and coprozoic forms (pp. 153–1229); part 3, the Spirochaetes (pp. 1231–1288); part 4, methods of investigation and rules of nomenclature (pp. 1289–1349; part 5, blood parasites of vertebrates and Trypanosomidae of invertebrates (pp. 1351–1414); and part 6, references to the literature—Protozoa (pp. 1417–1505) and Spirochaetes (pp. 1505–1514).

Marine borers on the Atlantic coast of Canada, R. H. M'GONIGLE (*Canada Council Sci. and Indus. Research Rpt. 15 (1925), pp. 67, figs. 18*).—Following a brief introduction, the author deals with the literature and reports upon a survey, local conditions, general conditions, and the influence of separate factors. A summary and a bibliography of four pages are included.

Studies on insect metamorphosis, III, H. SINGH-PRUTHI (*Brit. Jour. Expt. Biol., 3 (1925), No. 1, pp. 1–8*).—The influence of starvation is dealth with.

A new method for comparing the efficiency of stomach insecticides [trans. title], R. JANISCH (*Nachrichtenbl. Deut. Pflanzenschutzdienst, 6 (1926), No. 3, pp. 18–20; abs. in Rev. Appl. Ent., 14 (1926), Ser. A, No. 4, p. 192*).—Larvae of *Pieris brassicae* that had all undergone their last molt on the same day were placed in Petri dishes and fed for 1 to 2 days on unpoisoned leaves. They were then given cabbage leaves poisoned by being shaken up in a bottle containing the insecticide in dust form. The leaves were weighed before and after dusting, and their outlines were traced on squared paper before and after feeding. It was thus possible to ascertain the quantity of poison ingested up to death. A table is given showing the amounts for 21 metallic compounds, sulfur, and phosphorus, and a second table shows the number of days of feeding on the poisoned leaves. The experimental data are said to agree with

the results that have been obtained empirically with stomach poisons. Diortholead arsenate was found superior to all other relatively insoluble arsenical compounds.

Fish oil, an efficient adhesive in arsenate-of-lead sprays, C. E. Hood (*U. S. Dept. Agr. Bul. 1439 (1926), pp. 22, figs. 16*).—Experimental work conducted from 1921 to 1924 has shown that linseed oil, fish oil, and corn oil, three drying oils, stand out preeminently as adhesives. Of these, corn oil is not so good an adhesive as either linseed oil or fish oil, but is much more efficient than any of the other adhesives tested, which rank in the following order: Proprietary miscible oil, proprietary casein product, lead oleate, flour, and soap. Since fish oil adheres to the leaves only slightly less than linseed oil and is much less expensive, it is the one to be recommended for use. The best results are obtained by adding the fish oil after the arsenate of lead has been well mixed with the water and while the mixture is being agitated. The mixture should be agitated at all times while it is being applied. In high-power spraying the agitation of the material is usually excellent, but with the smaller outfits, such as the barrel pump, the agitation is sometimes poor, and satisfactory results can not be obtained either in the even distribution of the poison or in the adhesive qualities of the mixture.

Tar-distillate washes: Their comparative effectiveness under different conditions, on various pests, and at increasing concentrations, W. Goodwin, A. M. Massee, and R. H. Le Pelley (*Jour. Pomol. and Hort. Sci., 5 (1926), No. 4, pp. 275–286, fig. 1*).—In preliminary trials in the field against the hop aphid, tar-distillate washes of known composition did not prove superior to a proprietary article, but none of the washes proved sufficiently toxic under the conditions described. At 7.5 per cent strength, a tar-distillate wash gave encouraging results against winter moth eggs in the field. Between 5 and 10 per cent is probably the optimum strength, although higher concentrations may slightly increase the actual efficiency. The experiments indicate the possibilities of evolving a fairly accurate technique for measuring the efficiency of egg-killing washes in the field.

Injury to glasshouse plants from hydrocyanic acid gas following the application of copper fungicides, E. F. Guba (*Phytopathology, 16 (1926), No. 9, pp. 633, 634*).—In this contribution from the Massachusetts Experiment Station attention is called to the fact that fumigation of citrus trees with hydrocyanic acid gas following the application of Bordeaux mixture is accompanied by serious injury to the trees, the injury being manifested in the form of browning of the leaves and defoliation, often accompanied by severe pitting of the fruit. In some cases injury has resulted as late as 11 months after the copper spray was applied, although ordinarily little if any injury occurs 6 months after spraying. To avoid this injury where brown rot and other diseases are to be controlled, some growers have adopted the practice of spraying 2 or 3 days after fumigation, while others have discontinued the use of Bordeaux entirely in favor of other fungicidal preparations free of copper (E. S. R., 49, p. 849). It is pointed out that no data have been obtained to indicate how long after the application of copper greenhouses may be fumigated without danger of injuring the plants, although the author has record of an instance of no injury from fumigation with calcium cyanide 46 days after the copper treatment. Where fungus diseases are important in the greenhouse, the cyanide fumigant should always precede the application of the copper fungicide by 1 or 2 days, or the use of cyanide should be abandoned in favor of tobacco fumigants.

[Report of the South Dakota Station] department of entomology-zoology, H. C. SEVERIN (*South Dakota Sta. Rpt. 1926, pp. 19–22*).—This is a brief report on the progress of work with the common field cricket (E. S. R., 55, p. 355) and the lesser peach borer. The latter is a serious pest of plums in South Dakota and has been found in the eastern half of the State attacking cultivated cherry and chokecherry. The studies indicate the pest to be single brooded. Its natural enemies include a Microbracon parasite of the caterpillars. Experimental control work is under way.

Insect and other invertebrate pests of 1925, R. S. MACDOUGALL (*Highland and Agr. Soc. Scot. Trans., 5. ser., 38 (1926), pp. 151–194, figs. 27*).—In this annual report (E. S. R., 54, p. 257) the author deals with liver rot of sheep, gapes in poultry, hairworms in domestic water supply, the apple fruit moth or apple miner (*Argyresthia conjugella* Zell.), a more extended account of which has been noted (E. S. R., 55, p. 557), other insect enemies of apple fruits, arsenic and apples, the vapourer moth (*Orgyia antiqua*), the magpie moth (*Abraxas grossulariata*), the gooseberry sawfly (*Nematus ribesii*), *Enarmonia diniana* Gn. (*pinicolana* L.), the pea moth (*Cydia nigricana*), the cinnabar moth (*Hipocrita jacobaeae* L.), the gold spot (*Plusia festucae*) and the silver-Y (*P. gamma*) moths, hawk moths, *Diastrophus rubi*, the yellow dung fly (*Scatophaga stercoraria*), the green spruce aphid (*Myzaphis abietina* Wlk.), the lesser grain borer (*Rhizopertha dominica* Fab.), the greenhouse grasshopper (*Tachycines asynamorus*), and wood lice or slaters.

The principal enemies of alfalfa in Argentina [trans. title] (*Min. Agr. [Argentina], Secc. Propaganda e Informes [Circ.] 645 (1926), pp. 20, pls. 3*).—A brief account is given of the more important insect and related enemies of alfalfa.

[The animal enemies of rice], H. WINKLER (*Tropenpflanzer, 28 (1925), No. 4, pp. 174–189*).—An account is given of the more important insect and related enemies of rice, with references to the literature.

Notes on some unusual insect pests on fruit, F. V. THEOBALD (*Jour. Pomol. and Hort. Sci., 5 (1926), No. 4, pp. 241–247, figs. 6*).—These notes relate to *Mania maura; Forficula auricularia;* and an attack of thrips on American blackberries, two of the commonest of which were *Thrips tabaci* (Lind) and *T. flavus* Schr., while numbers of *T. adusta* (Uzel) occurred here and there and a few *Limothrips cerealium* Hal.

Citrus insects and their control, J. R. WATSON (*Florida Sta. Bul. 183 (1926), pp. 289–423, figs. 87*).—This is a revised edition of Bulletin 148, previously noted (E. S. R., 39, p. 557).

Insects affecting coffee in Trinidad and Tobago, F. W. URICH (*Agr. Soc. Trinidad and Tobago, Proc., 26 (1926), No. 8, pp. 384–388*).—A brief account of the more important coffee pests.

Experiments in fumigating olives with calcium cyanide for Phloeothrips oleae Costa [trans. title], M. BENLLOCH (*Bol. Estac. Patol. Veg. [Inst. Agr. Alfonso XII, Madrid], 1 (1926), No. 2, pp. 55–64, figs. 4*).—This is a brief account of fumigation work in olive groves at Mora, Toledo, Spain.

Heteroptera or true bugs of eastern North America, with especial reference to the faunas of Indiana and Florida, W. S. BLATCHLEY (*Indianapolis: Nature Pub. Co., 1926, pp. 1116, pls. 12, figs. 215; rev. in Science, 64 (1926), No. 1667, p. 578*).—This is the fourth and last of the author's manuals or treatises on certain groups of the insects of eastern North America, the preceding works having been noted (E. S. R., 24, p. 259; 36, p. 157; 43, p. 851).

In the introduction (pp. 3–30) the author discusses the classification, relation of the Heteroptera to other insects and animals, the external structure

of a true bug, habits, collection and preservation, etc. A descriptive catalogue of the order Heteroptera of eastern North America, which follows (pp. 31–1087), includes keys for the separation of the families, subfamilies, genera, and species. Descriptions are given of the genera and of 1,253 forms recognized by the author as occurring in eastern North America, together with their distribution, a few, chiefly from Florida, being described as new. A table showing the local distribution of eastern Heteroptera (p. 1087), a bibliography (pp. 1088–1110), and a general index are included. The review is by N. Banks.

Experiments on the control of the apple capsid bug (Plesiocoris rugicollis Fieb.), L. N. STANILAND (*Jour. Pomol. and Hort. Sci., 5 (1926), No. 4, pp. 267–274*).—An account is given of the distribution of *P. rugicollis* and its importance as a pest in the Bristol Province, England. Experiments in control show that considerable ovicidal action was exercised by certain tar-distillate washes when used at 8 and 10 per cent strengths. The season's work suggests that winter washing with a suitable tar-distillate wash, followed by a spring application of a suitable oil spray or a nicotine wash, will prove an efficient method of controlling this capsid bug.

The genus Erythroneura north of Mexico (Homoptera, Cicadellidae), W. ROBINSON (*Kans. Univ. Sci. Bul., 16 (1926), No. 3, pp. 101–155, pls. 8*).—A synopsis of this important genus, which includes the grape leafhoppers.

The plant-lice or Aphididae of Great Britain, F. V. THEOBALD (*London: Headley Bros., 1926, vol. 1, pp. IX+372, figs. 196; rev. in Rev. Appl. Ent., 14 (1926), Ser. A, No. 7, p. 342; Ent. Mo. Mag., 3 ser., 12 (1926), No. 139, p. 171*).—This is the first volume of a work described by the author as a collective monograph of the British aphids exclusive of the Phylloxeridae (Phylloxera and Chermes in the broad sense), which are considered as separate from the true Aphididae. It deals with all the forms so far found or received by the author in Britain and includes such of Walker's species as are recognizable. Keys are given for the subfamilies, tribes, subtribes, genera, and species, and the classification is based upon that given by Baker (E. S. R., 43, p. 758) for the North American representatives of the family. Descriptions are given of the species, and figures of structural details of most are appended.

Notes on the Aphididae of Egypt, W. J. HALL (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 68 (1926), pp. VIII+62, pls. 3*).—Following an introduction and list of the Aphididae of Egypt, the author presents notes on the Aphididae of Egypt (pp. 1–48), a list of the more important works consulted (pp. 49, 50), a host plant index (pp. 51–55), and a subject index (pp. 57–62).

The reaction to flea bites, A. E. BOYCOTT (*Nature [London], 18 (1926), No. 2973, p. 591*).—The author points out that the irritating wheals which may follow the bites of various insects are anaphylactic in origin, and that it is only after a person has become sensitized to the proteid in the liquid which fleas inject in the process of biting that the familiar local irritable swelling develops. Some persons who are extensively flea bitten seem to become immune, and others are naturally immune.

The codling moth, F. W. PETTEY (*Union So. Africa Dept. Agr. Bul. 9 (1926), pp. 15, pls. 7*).—This is a general account dealing particularly with control measures.

The currant borer, P. H. THOMAS (*Tasmanian Fruitgrower and Farmer, 12 (1926), No. 135 p. 11*).—This is a brief account of one of the most serious pests of small fruits in Tasmania.

Levuana moth of the coconut, A. DESPEISSIS (*Fiji Dept. Agr. Ann. Rpt. 1924, pp. 2, 3*).—This is a brief account of *L. iridescens* and efforts being made for its control, particularly through the introduction of parasites, in Fiji.

Pieris brassicae and its parasite, Apanteles glomeratus, H. MACK (*Entomologist, 59 (1926), No. 761, pp. 278, 279*).—This is a brief account of observations made at Harlow, Essex, England, in which the author points out that the larva alone is attacked by this parasite.

Brief notes on the biology of the pink boll worm [trans. title], P. IBARRA GARCÍA (*Bol. Dir. Estud. Biol. [Mexico], 3 (1925), No. 1, pp. 1–11; abs. in Rev. Appl. Ent., 14 (1926), Ser. A, No. 2, p. 83*).—This paper contains data collected by the author, who was appointed by the Mexican Government in 1920 to study the biology of the pest in Mexico.

The "spruce budworm" biocoenose, I, II, I. W. BAILEY (*Bot. Gaz., 80 (1925), Nos. 1, pp. 93–101, pls. 3; 3, pp. 300–210, pls. 3, figs. 3*).—The first part of this paper deals with frost rings as indicators of the chronology of specific biological events and the second part with structural abnormalities in *Abies balsamea*.

American two-winged flies of the genus Microphthalma Macquart, with notes on related forms, J. M. ALDRICH (*U. S. Natl. Mus. Proc., 69 (1926), Art. 13, pp. 8*).—An account is given of seven species of Microphthalma, two of which are described as new to science. Members of this genus have been frequently reared as parasites of the larvae of May beetles of the genus Phyllophaga.

The pear midge: Further observations and control with calcium cyanide, D. MILLER (*New Zeal. Jour. Agr., 30 (1925), No. 4, pp. 220–224, fig. 1*).—In this paper (E. S. R., 46, p. 460) the results of control experiments are discussed. The results of these experiments, as gauged from the tents, showed that the dosage of 1½ lb. to 200 sq. ft. was the weakest effective strength that could be used for 100 per cent control.

Parasites of the pear-midge (Perrisia pyri): First attempt at their establishment in New Zealand, D. MILLER (*New Zeal. Jour. Agr., 32 (1926), No. 6, pp. 379–393, figs. 9*).—This account records the parasitism during the summer of 1925 of the pear leaf-rolling midge (*P. pyri* Bcb.) in the vicinity of Bordeaux by *Platygaster* sp., and later as high as 58 per cent in the vicinity of Paris. *Inostemma* sp. and several chalcids of one or more species were also found near Paris. Consignments of pears and leaves containing parasitized *P. pyri* were sent from France to New Zealand in August and October. It was found that both the *Inostemma* and *Platygaster* parasitize the eggs of the midge, and that their larvae are internal parasites of the midge larvae, while the larvae of the chalcidoids are external parasites of the latter.

British bark-beetles, J. W. MUNRO (*[Gt. Brit.] Forestry Comn. Bul. 8 (1926), pp. 77, pls. 10, figs. 32*).—The subject is dealt with under the headings of general biology, importance in forestry, and structure and classification, with brief accounts of genera and species. A list of British bark beetles arranged according to host plants and a bibliography of four pages are appended.

The Buprestidae of North America exclusive of Mexico, W. J. CHAMBERLIN (*Corvallis, Oreg.: Author, 1926, pp. 291*).—This catalogue includes the synonymy, a bibliography, the distribution, type locality, and hosts of each species of Buprestidae, of which 416 are recognized. A list of authors and titles is appended (pp. 245–289).

On the males and an intersex-like specimen of the parthenogenetic saw-fly Pristiphora pallipes Lep., A. D. PEACOCK (*Brit. Jour. Expt. Biol., 1 (1924), No. 3, pp. 391–412, figs. 17*).—While conducting biological experiments on parthenogenesis in sawflies during 1923 the author obtained two males and an intersex-like specimen of the species *Pristiphora pallipes* Lep., which he here describes and discusses. It is stated that this species appears almost completely

thelytokous, the males being exceedingly rare, and that sexual abnormalities in it have never been observed before.

Studies in the parthenogenesis and sexuality of saw-flies (Tenthredinidae), II, A. D. PEACOCK (*Brit. Jour. Expt. Biol., 3 (1925), No. 1, pp. 61–84, figs. 10*).—This second paper on the subject, the first of which is noted above, deals with a gynandromorph of *Pteronidea* (*Nematus*) *ribesii* Scop., with observations on gynandromorphism and saw-fly sexuality.

Descriptions of new reared parasitic Hymenoptera and some notes on synonymy, C. F. W. MUESEBECK (*U. S. Natl. Mus. Proc., 69 (1926), Art. 7, pp. 18*).—This paper gives descriptions of 14 new species of Braconidae and synonymical notes involving certain of Provancher's species of the braconid subfamily Microgasterinae.

The work-day of the bee, J. M. HOVER and F. E. LORD (*Gleanings Bee Cult., 54 (1926), No. 11, pp. 710–712, figs. 3*).—The authors describe an apparatus by which a colony records the fluctuating weight of the hive of bees day by day.

The first successful attempt to control the mating of queen bees, G. H. CALE (*Amer. Bee Jour., 66 (1926), No. 11, pp. 533, 534, fig. 1*).—This is a report of work conducted by L. R. Watson, of Alfred, N. Y., who successfully accomplished the mating of queen bees artificially.

Beekeeping up to date, A. B. FLOWER (*London and New York: Cassell & Co., 1925, pp. X+110, pls. 8, figs. 7*).—A practical account.

Seventh International Congress of Beekeepers, Quebec, September 1 to 4, 1924 (*7. Congrès International d'Apiculture, Quebec, 1924. Quebec: Imp. Charrier & Dugal, 1925, Fr. Sect., pp. 1–277, figs. 68; Eng. Sect., pp. 278–500, figs. 58*).—This is a report of the proceedings of this congress.

Infestation of flax seed by mites, A. G. DAVIN (*Linen Indus. Research Assoc., Research Inst. Mem. 31 (1926), pp. 45–52, pls. 4*).—An account of infestation by mites, particularly *Tyroglyphus longior*, *T. siro*, *Glyciphagus cadaverum*, and *Aleurobius farinae*, and methods of combat.

Etiology of Oroya fever.—V, The experimental transmission of Bartonella bacilliformis by ticks (Dermacentor andersoni), H. NOGUCHI (*Jour. Expt. Med., 44 (1926), No. 5, pp. 729–734, figs. 3*).—In experiments here reported *B. bacilliformis* was transmitted from infected to normal rhesus monkeys by the bite of *D. andersoni* (*D. venustus* Banks). A long period of feeding, both on the infected and on the normal animal subjected to infection, was required in order to secure positive results. The infection transmitted by the ticks was mild, but definite, as shown by the recovery of *B. bacilliformis* from the lymph nodes and blood.

ANIMAL PRODUCTION

Natural history of the races of domestic mammals, M. HILZHEIMER (*Natürliche Rassengeschichte der Haussäugetiere. Berlin: Walter de Gruyter & Co., 1926, pp. 235, figs. 124*).—The various types of the different species of domestic mammals are described, with special reference to their development and zoological relations.

Materials for the physiology of the morphogenesis.—I, Cryptorch rams [trans. title], M. M. ZAVADOVSKIĬ (*Zawadowsky*) (*Trudy Lab. Eksper. Biol. Moskov. Zooparka (Trans. Lab. Expt. Biol. Zoopark Moscow), 1 (1926), No. 1, pp. 67–80, figs. 7; Eng. trans., pp. 76–80*).—An account is given of two cryptorchid Wallachian rams, which in contrast to normal males were hornless and showed a feeble development of the skull bones. The author discusses the fact that normally the horns start growing before the sex instinct develops,

while in these cryptorchids horn development had not started although the sex instinct was present in one individual.

The influence of castration on the development of horns in Merino sheep [trans. title], M. M. ZAVADOVSKIĬ (*Zawadowsky*) (*Trudy Lab. Èksper. Biol. Moskov. Zooparka* (*Trans. Lab. Expt. Biol. Zoopark Moscow*), *1* (*1926*), *No. 1, pp. 49–66, figs. 13; Fr. abs., pp. 64–66*).—Studies of horn development in Merino sheep showed that the average size of the horns of ewes at one year was 1.6 cm., of castrated males 7.3 cm., and of normal males 58.9 cm. The size of the horns thus appears to be influenced by the presence of the sexual hormones.

Bilateral and unilateral castration in Cervus dama and C. elaphus [trans. title], M. M. ZAVADOVSKIĬ (*Zawadowsky*) (*Trudy Lab. Èksper. Biol. Moskov. Zooparka* (*Trans. Lab. Expt. Biol. Zoopark Moscow*), *1* (*1926*), *No. 1, pp. 18–48, figs. 14; Eng. abs., pp. 44–48*).—This paper deals mainly with the effects of the sexual hormones on horn development in deer. The stages of horn growth were classified, and it was found that the development of knobs from which the horns form, the branching of the horns, and the hardening and drying of the growing horn were the stages dependent upon the sex hormone.

Bilateral castration was found to have an influence depending upon the age of the deer at the time of castration. Unilateral castration experiments showed no specific relation between the presence or absence of one testicle and the presence or absence of one horn. A female in which testicular tissue was transplanted showed male instincts on the ninth, tenth, and eleventh days after the operation.

Investigations of experimental hermaphroditism with variations in the amount of testicular and ovarian tissue [trans. title], W. KRAUSE (*Biol. Gen.*, *2* (*1926*), *No. 3, pp. 262–300, pls. 7*).—The characteristics of 36 male guinea pigs in which ½, 1, or 2 ovaries were transplanted at from 4 to 8 weeks of age, with or without semicastration, are described, with special reference to the development of female secondary sex characters. The animals were under observation for from 1 to 7 months at the Physiological Institute of the University of Dorpat-Tartu, Esthonia.

In 4 of 16 cases in which 2 ovaries were transplanted into entire males, a noticeable development of the mammary glands and teats was apparent. All of 6 semicastrated individuals in which 2 ovaries were ingrafted showed similar characteristics. The time required for the action of the ingrafted ovary to become evident was variable, being the shortest when 1 testicle was removed. The mammary glands of the positive reacting animals were better developed both macroscopically and microscopically than the mammary glands of virgin females or females after lactation.

Observations on the oestrous cycle of the albino mouse, A. S. PARKES (*Roy. Soc.* [*London*], *Proc., Ser. B, 100* (*1926*), *No. B 701, pp. 151–170*).—In studies of the oestrous cycle and various related factors in the albino mouse the duration of the cycle was found as follows: For unmated females 5.7 days, and for normal females mated with vasectomised bucks 11 days. The increase in the length of the cycle in the latter case was considered as due to the formation of a decidua, resulting from the stimulation of the vaginal plug. In 80 per cent of the matings of normal males with normal females in which a vaginal plug was formed pregnancy followed, the average gestation period being 19 days. Blood, however, appeared in the vaginal smear on about the tenth to twelfth day of gestation.

Continued lactation brought about by placing foster litters on the dam inhibited oestrum for about 3 weeks except for the post-partum period. The

number of young suckled in such cases was important, as in small litters oestrum occurred in less time than with large litters. Unilateral ovariotomy did not affect the cycle.

On the properties of the gonads as controllers of somatic and psychical characteristics.—IX, Testis graft reactions in different environments (rat), C. R. MOORE (*Amer. Jour. Anat., 37 (1926), No. 2, pp. 351–416, figs. 15*).—In studies of the physiological properties of the gonads at the University of Chicago, whole rat testes have been successfully transplanted into normal and castrated males and females. Such transplantations have persisted for from 1 to 6.5 months in many of the animals.

Grafts showing various degrees of activity were found irrespective of the sex of the animal, but only those transplanted to the scrotum produced normal spermatozoa. This is assumed to be due to the temperature regulating properties of the scrotum (E. S. R., 53, p. 428.)

The phosphorus metabolism and the influence of the testes upon it [trans. title], L. ÎA. BLÎAKHER (L. J. BLACHER) (*Trudy Lab. Èksper. Biol. Moskov. Zooparka (Trans. Lab. Expt. Biol. Zoopark Moscow), 1 (1926), No. 1, pp. 231–234; Eng. abs., p. 234*).—The determinations of phosphorus metabolism of four guinea pigs before and after castration indicated that the removal of both testicles resulted in a reduction in the amount of phosphorus excreted. The phosphorus balances were negative before castration but positive following the operation.

Histological changes in the testis of the guinea-pig during scurvy and inanition, B. LINDSAY and G. MEDES (*Amer. Jour. Anat., 37 (1926), No. 2, pp. 213–235, figs. 7*).—In studies of the effect of scurvy and inanition on the histological structure of the testis of guinea pigs, it was found that inadequate amounts of feed or rations deficient in vitamin C caused a degeneration of the seminal epithelium of the testes. The characteristics of this degeneration included a reduction in the normal number of the late stages of spermatogenesis, desquamation of the germinal epithelium into the lumina of the tubules, and distintegration of the cytoplasm with the production of a reticular appearance. The Sertoli cells were not affected, and they persisted even in tubules showing the advanced stages of degeneration. Almost complete regeneration of the germinal tissue occurred within 17 days after removal from a scorbutic diet.

Preliminary analyses of the tissues and of the metabolism of animals suffering from dietary sterility, E. M. ANDERSON (*Anat. Rec., 32 (1926), No. 3, p. 227*).—Studies at the University of California of the composition of the blood of animals fed on natural foods and on vitamin E deficient rations have indicated very similar results for animals on the two types of rations, and no definite change in the blood resulted from addition of vitamin E in the form of wheat germ oil to the ration. The young born in the first litters of female rats on vitamin E deficient rations were also analyzed at birth for crude protein, total lipoids, and ash. The crude protein, total lipoids, and ash account for only 73.4 per cent of the total solids in normal young, but the same constituents made up 91.5 per cent of the total solids in the young from pure-food mothers. This, however, suggests no relation to sterility. No differences in the nitrogen and fat metabolism on pure-food diets, with and without wheat germ oil, have been revealed which would account for the fertility of the mothers receiving vitamin E.

Vitamin E and reproduction on synthetic and milk diets, H. A. MATTILL and M. M. CLAYTON (*Jour. Biol. Chem., 68 (1926), No. 3, pp. 665–685, fig. 1*).—Continuing the studies of vitamin E for reproduction (E. S. R., 52, p. 864),

approximately 150 rats were reared from weaning on synthetic rations consisting of 18 per cent of casein, 4 per cent of salt mixture, 2 per cent of cod-liver oil, and 5 per cent of yeast, with 8 or 23 per cent of lard, the balance being composed of starch. In certain rations 5 per cent of wheat germ oil, cottonseed oil, or olive oil replaced an equal amount of lard, or 0.5 per cent of unsaponifiable constituents of cottonseed oil or 0.2 per cent of unsaponifiable constituents of olive oil replaced an equal amount of lard. In one lot 1 per cent of vitamin B Harris replaced the yeast, and the animals or feeds of another lot were irradiated.

Good growth was obtained on all rations except the one containing vitamin B Harris and the animals appeared in good condition, but normal reproduction occurred only on the ration containing the wheat germ oil. A few young were born on the other rations, and several resorptions occurred, but only for a short time when reproduction ceased entirely. The gonads of the males showed more or less complete degeneration on these rations. Two types of yeast were used but they did not appear to differ as sources of vitamin E.

In curative tests male animals from the above lots were given supplements of wheat germ oil or wheat germ, or were placed on the colony ration. Some regained fertility, while many remained sterile. Such variation in the prolificacy of individuals was evidently due to the length of time that the vitamin E deficient ration was fed before making the change in the ration, the stage of gonad degeneration, and the age of the experimental rats when the feeding commenced. Degeneration of the testicles was measured by comparative weights in these tests.

Fertility was restored in the females when the rations were supplemented with 1 per cent of wheat germ oil, but the number of young per litter did not approach normal. When larger amounts of wheat germ oil were given, litters of normal size were produced, though lactation was subnormal even with 5 per cent of wheat germ oil.

Increased food consumption in pseudopregnancy, H. Goss (*Anat. Rec., 32 (1926), No. 3, p. 232*).—Records of the food consumption of pseudopregnant females indicated that during 2 weeks following mating with vasectomized males, when the oestrous cycle ceased, the food consumption increased from 25 to 50 per cent above normal, with a corresponding increase in body weight.

The feeding value of different grades of barley as they are separated in a modern seed-cleaning machine (Schule system) [trans. title], F. Honcamp and W. Schramm (*Landw. Vers. Sta., 104 (1926), No. 5–6, pp. 285–296*).—In feeding experiments with 2 wethers, using the various grades of barley separated by the seed-cleaning device, it was found that the normal grain which was separated because of light weight contained 10.29 per cent of digestible protein and had a starch value of 85.9 kg. per 100 kg. of grain. The corresponding values for abortive grain were 9.93 per cent and 85.6 kg., and for the heavy sound grain 9.05 per cent and 82.6 kg., respectively. The nutritive values of other grades and of the grain direct from the threshing machine were also determined.

Investigations on the composition and digestibility of barley and its milled products [trans. title], F. Honcamp and W. Schramm (*Landw. Vers. Sta., 104 (1926), No. 5–6, pp. 297–312*).—The amounts of digestible protein and the starch value as determined per 100 kg. of the barley products with wethers were for ground barley 10.93 and 83.2 kg., barley feed meal 9.31 and 72.9, the first separation of the bran 3.65 and 48.7, the second separation 3.83 and 40.7, and the third separation of the bran 12.41 and 75.1 kg., respectively.

Silage experiments at Nagpur, H. E. Annett and A. R. Padmanabha Aiyer (*India Dept. Agr. Mem., Chem. Ser., 8 (1926), No. 10, pp. 189–209*).—Changes in the composition of juar (*Sorghum vulgare*) ensiled in four pit silos and one tower silo are reported in various tables, and the data are discussed. When the silos were opened the top layer of all was moldy, and in the tower silo there was a considerable shrinkage from the sides, which likewise molded. The sample bags placed in different portions of the silos showed small changes in their dry-matter content. A part of the crude fiber appeared to have broken down during ensiling, which resulted in the formation of nitrogen-free extract, but the latter was at least partially changed into organic acids.

No significant differences were found between the tower or pit silos made in black cotton soil or in trap rock in respect to the changes in the composition of the silage. There appeared to be no advantage derived from sprinkling the crop with water after it was put in the silo or allowing the plants to wilt before ensiling.

Swedish fish meal, its composition and feeding value [trans. title], N. Hansson (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 302 (1926), pp. 16; Ger. abs., p. 16*).—Tests with dairy cows and swine on the feeding value of a fish meal containing approximately 65 per cent of crude protein, 2 to 2.5 per cent of fat, and 16 to 17 per cent of inorganic matter have indicated that this feed may be advantageously included as a protein supplement in the rations of these animals. One kg. of fish meal was found to be the equivalent of one fodder unit. Amounts as large as 1 to 1.5 kg. of the fish meal daily had no influence on the flavor of the milk produced by dairy cows, and this feed appeared to increase the butterfat content. The large percentage of minerals present was considerably in its favor, in addition to its high protein content.

Does the addition of sodium chloride increase the value of a corn ration for growing animals? H. H. Mitchell and G. G. Carman (*Jour. Biol. Chem., 68 (1926), No. 1, pp. 165–181, figs. 8*).—In studying the sodium and chlorine requirements of animals at the Illinois Experiment Station, eight pairs of 5-week-old rats and four pairs of chicks were selected for growth and balance studies during 12 weeks. The basal ration fed to one animal of each pair consisted of 87 parts of ground corn, 10 parts of casein, 2 parts of cod-liver oil, and 1 part of calcium carbonate. One part of the corn was replaced by one part of sodium chloride in the ration fed to the other individual of each pair. The basal ration thus contained 0.047 per cent of sodium, 0.041 per cent of chlorine, and 2.58 per cent of nitrogen, while the latter ration contained 0.481 per cent of sodium, 0.724 per cent of chlorine, and 2.57 per cent of nitrogen.

The data on growth showed that the animals receiving the sodium chloride supplement made more rapid gains and required less feed per unit of gain than those on the basal ration only. In four pairs of rats which received similar amounts of feed the rate of growth of those on the basal ration tended to overtake the growth of the other individuals of the pairs toward the end of the period, due to the restriction in food consumption of the larger animals. The other pairs, for which the amount of feed was allotted in proportion to the two-thirds power of the body weight, did not exhibit this tendency. The individuals receiving sodium chloride exceeded their litter mates in growth by 43 per cent in the 4 former pairs and 89 per cent in the 4 latter pairs of rats. The results with the chicks were very similar.

The balance trials with both the rats and the chickens showed distinctly more favorable balances of both sodium and chlorine when the ration was

supplemented with sodium chloride. The rats showed a considerable negative sodium balance on the basal ration which it is stated could not have continued through the entire 82 days, and therefore can not be typical of the entire experimental period. The nitrogen balances were also larger on the supplemental ration, but the digestibility of the nitrogen and the metabolizable energy of the two rations were similar.

It is concluded that the concentration of sodium and chlorine in corn is not sufficient to promote normal growth in rats and chickens, and that this deficiency limits the utilization of its energy and protein for growth.

The value of green corn stacked as a feed for cattle, J. W. Wilson (*South Dakota Sta. Rpt. 1926, p. 5*).—Five lots of five 2-year-old cattle were used for comparing stacked green corn, corn silage, corn fodder, alfalfa hay and corn silage, and all the alfalfa hay the steers would eat. Stacked green corn proved to be the poorest feed ever used at the station, as the steers not only lost weight during the 54-day period but were inferior to the cattle in the other lots.

A comparison of white and yellow corn for growing and fattening swine and for brood sows, J. B. Rice, H. H. Mitchell, and R. J. Laible (*Illinois Sta. Bul. 281 (1926), pp. 177–204*).—Eight sows were divided into two equal groups. One lot received yellow corn, yellow corn bran, and tankage and the other lot white corn, white corn bran, and tankage. The sows were kept on the experiment through 2 gestation periods; 2 sows were fed white corn through a third and 1 of these through a fourth and fifth gestation period. Pigs farrowed by these sows were divided and fed the same rations as their dams. To further test the rations, two groups of 8 pigs each from sows on normal rations were fed as above. In still another growth experiment, 4 lots of 20 pigs each averaging a little over 60 lbs. were fed the following rations: (1) Silver Mine (white) corn and tankage, (2) yellow corn and tankage, (3) Silver Mine corn, tankage, and alfalfa meal, and (4) White Democrat corn and tankage. In a final experiment 2 lots of 10 pigs, each averaging 50 lbs., were self-fed white corn and tankage. One lot received cod-liver oil in amounts equivalent to 1 per cent of the ration.

Little or no difference was noted in the sows or pigs during the suckling period of the first two gestations, and the authors believe that sows developed on adequate diets can store enough vitamin A to carry them through two gestation and lactation periods. In the third gestation period, 1 sow died soon after farrowing. The other sow farrowed dead pigs for this and the subsequent period. The pigs farrowed had little hair, but were otherwise apparently normal. During the fifth period, 1 per cent of cod-liver oil was added to this sow's ration and at farrowing time she produced normal living pigs.

Normal weanling pigs farrowed by sows carried through gestation on white corn rations failed to thrive and ultimately developed pathological symptoms and died when carried further on the same ration. Pigs from sows receiving a normal diet and raised to 60 or 70 lbs. on these rations made normal gains for a time when fed on white corn, but at weights of 175 to 200 lbs. developed the characteristic symptoms of white corn feeding. Small amounts of alfalfa meal were effective in correcting white corn deficiencies in pigs weighing from 60 to 227 lbs. The addition of 1 per cent of cod-liver oil to the white corn ration indicated that the pathological symptoms were due to a lack of vitamin A since pigs so fed made normal growth. The varieties of white corn tested were decidedly deficient in their vitamin A content.

[Feeding experiments with swine at the South Dakota Station], J. W. Wilson (*South Dakota Sta. Rpt. 1926, pp. 5, 6*).—The results of the following experiments are briefly reported:

Factors in summer feeding of market pigs.—The results obtained in tests of various methods of feeding stocker pigs on limited rations of farm grains with alfalfa pasture were similar to those previously noted (E. S. R., 56, p. 565). Limited rations of corn and tankage, ground barley and tankage, corn without tankage, and whole oats and tankage were found to rank in the order given in relative desirability.

Tankage requirements of market pigs fed barley and pasture.—The results of this experiment indicated that the protein supplied in a ration of ground barley, tankage, and alfalfa or rape pasture formed such an efficient combination that a smaller quantity of digestible crude protein is required than is called for by present day feeding standards.

Winter feeding fall pigs.—In tests of the comparative value of rations for fall pigs a remarkably high value for alfalfa hay was observed. Choice oats as a substitute for corn in limited rations including linseed meal, tankage, and alfalfa hay gave excellent results during the stocker period, but were not as good as corn during the finishing period. Full feeding from weaning to market age proved more economical than a combination of limited and full feeding.

Winter rations for brood sows.—Rations containing oats gave poor results when fed to gilts but the best results when fed to older sows.

The hog: Its use as a domestic animal and its importance to agriculture [trans. title], F. P. STEGMANN VON PRITZWALD (*In Forschungsarbeiten aus der Landwirtschaftswissenschaft. Festschrift zum 70. Geburtstage von Wilhelm Edler. Berlin: Paul Parey, 1925, pp. 154–176*).—This is essentially a brief history of the development of the hog as an animal of economic importance, with descriptions of the German breeds.

Fertility in sheep, J. E. NICHOLS (*Jour. Min. Agr. [Gr. Brit.], 33 (1926), No. 3, pp. 218–225*).—Data related to the fertility of different breeds of sheep obtained by a second questionnaire have yielded information which agrees closely with that previously derived from the first questionnaire (E. S. R., 53, p. 667).

Conformation and appointments of the horse, R. S. TIMMIS (*London: Forster Groom & Co., 1926, pp. 138, pls. 18*).—Includes popular directions for the selection, management, and handling of horses.

Fragment of skull of a horse from the interglacial deposits near Puławy (Poland) [trans. title], B. KĄCZKOWSKI and R. PRAWOCHEŃSKI (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Puławach (Mém. Inst. Natl. Polon. Écon. Rurale Puławy, 6 (1925), A, pp. 196–212, pls. 2, fig. 1; Eng. abs., pp. 211, 212*).—Measurements of a horse's skull found in the interglacial deposits near Pulaway have been compared with similar measurements of skulls of wild ancestral types of horses, furnishing new information on the probable origin of the various species.

Report of the committee on research in poultry husbandry, M. A. JULL ET AL. (*Poultry Sci., 5 (1926), Spec. No., June, pp. 1–30*).—The report of the committee on research in poultry husbandry of the American Association of Instructors and Investigators in Poultry Husbandry consists mainly of the reports of the subcommittees on nutrition, by C. W. Carrick; on breeding, by W. A. Lippincott; and on diseases, by C. H. Weaver.

The subcommittee reports are based on the returns from questionnaires sent to the various agricultural experiment stations in the United States and Canada, requesting information on the projects under investigation, opinions on cooperation, and suggestons as to the fields of most important research. Certain faults in the method of attacking problems are pointed out as applying particularly to the different lines of research undertaken.

Biometrical measurements of laboratory animals.—II, Domestic fowl [trans. title], K. Saller (*Ztschr. Wiss. Biol., Abt. D., Arch. Entwickl. Mech. Organ., 107 (1926), No. 4, pp. 625–650, figs. 12*).—Various measurements and relations between different parts of the bird are suggested for making biometrical studies of the size of fowls (E. S. R., 55, p. 26).

Further studies on the growth of the skeleton of the White Leghorn chicken, H. B. Latimer (*Anat. Rec., 32 (1926), No. 3, p. 236*).—In further studies of the rate of growth of the various parts of White Leghorn chickens at the University of Nebraska (E. S. R., 52, p. 172) the relation of the weights of the long bones to the entire skeletal weight was determined and studied statistically. The coefficients of variability for such determinations of the different bones were as follows: Humerus 13.8 per cent, radius 13.2, ulna 16.1, femur 7.9, tibia 8.4, and the tarsometatarsus 12 per cent. The weights per millimeter of length for the same 6 bones when plotted against body weight formed a curve which rose from hatching to maturity, flattening between 1,200 and 1,600 gm. In males the humerus and tarsometatarsus were heavier than in females. Ratios between the lengths of the various bones are pointed out.

Standard breeds and varieties of chickens.—II, Continental European, Oriental, game, ornamental, and miscellaneous classes, M. A. Jull (*U. S. Dept. Agr., Farmers' Bul. 1507 (1926), pp. II+30, figs. 43*).—This is a revision of and supersedes Farmers' Bulletins 1221 (E. S. R., 46, p. 172) and 1251 (E. S. R., 46, p. 769).

The Sussex fowl, L. F. Outram (*London: Poultry Press, Ltd. [1926], pp. 68, pls. 11*).—A popular account of Sussex fowls, with particular reference to the different varieties.

Poultry in Arizona, H. Embleton (*Arizona Sta. Timely Hints for Farmers, No. 155 (1926), pp. 20, figs. 7*).—Poultry conditions in Arizona are presented in a popular manner, and the problems of housing, feeding, and breeding of poultry are discussed. The marketing of poultry and poultry products and the methods of killing and dressing poultry are also considered.

[Experiments with poultry at the South Dakota Station], G. L. Stevenson (*South Dakota Sta. Rpt. 1926, pp. 32, 33*).—The results of experiments with poultry are briefly reported, several of which are continuations of experiments previously noted (E. S. R., 56, p. 567).

Grains high in fiber when fed alone again gave poor production and threw the hens out of condition.

Studies of the best usage of alfalfa for poultry feeding have shown that alfalfa fed green gave as good results as sprouted oats but could be used through a much more limited season. Alfalfa hay and soaked alfalfa chaff were used with no marked advantage, but ground alfalfa proved to be a desirable ingredient of the poultry mash.

In another experiment in which various sources of protein were compared, the best results were obtained from milk powder, tankage, and meat scrap, while the results with soy bean meal, ground soy beans, and cottonseed meal were much inferior. A mixture of 10 per cent tankage and 10 per cent milk powder proved to be the most economical egg producer and the birds gained in live weight.

In another experiment chicks were successfully raised on a board floor under an electric brooder without access to the soil until they had reached an average of nearly 1.5 lbs. in live weight.

Tests of the variation in temperature in different incubators showed that in glass front machines the low temperatures were near the front, while the temperature ran relatively high under heating pipes where no shield was used.

From these tests the necessity of shifting the position of the eggs in the tray during hatching is indicated.

Poultry feeding experiments, L. Hoh and Y. T. Kam (*Lingnaam Agr. Rev.*, *3* (*1926*), *No. 2*, *pp. 99–108*).—Three experiments dealing with the comparative value of local feeds for the crate fattening of poultry are reported from the Canton Christian College. Four rations were compared in each experiment as follows: Rice bran only; 3 parts of rice bran and 1 part of wheat bran; 2 parts of rice bran and 1 part of cooked polished rice; and 4 parts of rice bran, 2 parts of cooked polished rice, and 1 part of peanut cake. There were 12 pullets in each lot and the feeding period lasted 21 days, but lot weights were tabulated as taken on alternate days.

The results of the 3 tests showed that the maximum weights of the different lots were attained at from 14 to 18 days and a loss in weight occurred during the remainder of the feeding period. Unfavorable results were obtained in all experiments on the rations of rice bran only and of rice bran and wheat bran, but fairly satisfactory gains were made on the other two rations. Rice bran and cooked polished rice proved the most satisfactory in the first and second experiments, while the ration of rice bran, polished rice, and peanut cake was superior in the third test.

The effect of cod liver oil upon flavor in poultry meat, C. W. Carrick and S. M. Hauge (*Poultry Sci.*, *5* (*1926*), *No. 5*, *pp. 213–215*).—In studying the effect of cod-liver oil feeding on the flavor of poultry meat at the Indiana Experiment Station, 30 White Leghorn chickens, which had been reared in confinement to 5 or 6 months of age on a ration containing 2 per cent of cod-liver oil, were divided into 3 lots, which received the following respective amounts of cod-liver oil: None, 2, and 4 per cent. The birds were killed at intervals and cooked by different methods. The flavor was judged by 15 persons.

The results showed that when the 4 per cent diet was fed for 2 or more weeks, even after discontinuing the cod-liver oil for 10 days, an unusual taste was present in the chicken meat, and when 4 per cent of cod-liver oil was fed up to the time of killing, the flavor was very pronounced. The method of cooking and the temperature at which the meat was served were found to have a distinct effect on the amount of abnormal flavor reported. The flavor was least noticeable in fried chicken and most noticeable when the meat became cold.

It is apparent from the results that chickens should be fed on rations free from cod-liver oil for at least 2 weeks before slaughtering.

Application of "protozyme" (Aspergillus oryzae) to poultry feeding, F. H. Clickner and E. H. Follwell (*Poultry Sci.*, *5* (*1926*), *No. 5*, *pp. 241–247*).—A test dealing with the growth-promoting properties of protozyme, a group of vegetable enzymes produced by cultures of *A. oryzae*, is reported. Protozyme was included in the mash fed to 5 lots of 200 chicks each as follows: None, 1, 2, 3, and 5 per cent. Data on 100 pullets in each lot up to 20 weeks of age are given. At 20 weeks the average weights of the birds in the different lots receiving 0, 1, 2, 3, and 5 per cent of protozyme were, respectively, 2.65, 2.80, 2.89, 3.03, and 3.24 lbs. The total egg production in the pens at this time was, respectively, 24, 11, 2, 4, and 16.

In another experiment 4 lots of pullets, receiving supplements of 0, 1, 3, and 5 per cent of the protozyme in their mash, laid an average of 84, 88, 96, and 93 eggs per bird for the 7-months period, December to June.

Brooding and pullet development, P. Moore and M. R. Lewis (*Idaho Agr. Col. Ext. Bul. 63* (*1926*), *pp. 24*, *figs. 9*).—This gives a popular discussion of

the methods of caring for young chicks during the brooding period, including the feeding and separation of the pullets, with suggestions on the control of diseases, and descriptions of different types of houses for poultry.

Hatching and raising chicks, J. R. SMYTH (*Ky. Agr. Col. Ext. Circ. 110, 3. ed., rev. (1926), pp. 11, figs. 3*).—Popular directions for the hatching, rearing, and feeding of chicks.

Hatching quality of eggs with relation to management, H. D. GOODALE (*Poultry Sci., 5 (1926), No. 5, pp. 216–218*).—Brief results are given of the hatching qualities of eggs produced by hens and pullets having access to direct or filtered sunlight, and receiving rations with or without supplements of cod-liver oil or pig's liver. There was a general decline in the hatching percentage of the eggs of all lots from March 25 to April 22, followed by a sharp improvement, except for one pen receiving filtered sunlight and pig's liver which showed a continuous decline in hatching quality and the rate of egg production. Another lot receiving cod-liver oil and filtered sunlight also showed a low hatching percentage. The birds receiving unfiltered sunlight without supplements did better, but the best hatching was obtained with unfiltered sunlight, cod-liver oil, and pig's liver.

Report of the committee on egg-laying contest standardization, R. E. JONES (*Poultry Sci., 5 (1926), Spec. No., June, pp. 44–46*).—A compilation of recommendations of representatives or managers of fourteen different egg-laying contests.

The Missouri plan of certified breeding, B. WINTON (*Poultry Sci., 5 (1926), No. 5, pp. 219–224*).—A description of the method of certifying poultry breeders in Missouri.

DAIRY FARMING—DAIRYING

Manual of dairy science, A. H. R. AMESS and H. C. JOHNSON (*Auckland and London: Whitcombe & Tombs, [1926], pp. 207, figs. 71*).—A brief presentation of the principles of milk production and testing, and the manufacture of butter and cheese.

[Experiments with dairy cattle at the South Dakota Station], T. M. OLSON (*South Dakota Sta. Rpt. 1926, pp. 15, 17, 18*).—The results of two feeding experiments are briefly reported.

Self feeders for calves.—A continuation of this experiment (E. S. R., 54, p. 167) during 3 years has shown that the crooked legs and apparent stiffness were corrected when the calves were allowed access to sunlight.

Effect of ground soy beans and cottonseed meal on butter.—In a test to determine the amount of ground soy beans necessary to produce soft butter (E. S. R., 54, p. 66), the ration of 4 cows was modified at 10-day intervals by the replacement of 25, 50, 75, and 100 per cent of the grain with soy beans or cottonseed meal, but no marked differences were observed in the churning of the cream or the consistency of the butter. When 50 per cent or more of the ration consisted of soy beans the butter had an oily taste resembling castor oil.

Silage versus swedes for milk production, A. C. M'CANDLISH and A. M'VICAR (*Scot. Jour. Agr., 9 (1926), No. 2, pp. 194–201*).—Eight cows were selected for studying the comparative value of Picton swedes and oat, pea, bean, and vetch silage for milk production at the West of Scotland Agricultural College. Each cow received 7 lbs. of mixed hay and 12 lbs. of oat straw daily, with a grain mixture according to production. The rations also included an average of 22 lbs. of silage during the first and third 20-day

periods, and 40 lbs. of swedes during the second 20-day period. Some silage was refused, especially toward the end of the feeding period.

The average results showed that while roots were fed 7 per cent more milk and 3 per cent more fat were produced. This difference was considered as significant, since every cow produced more milk with roots than with silage. Differences in the feed consumption, the composition of the silage and roots, and the equivalent values of the two succulent feeds are pointed out and discussed.

Nutrients required for milk production with Indian food-stuffs, F. J. Warth, L. Singh, and S. M. Husain (*India Dept. Agr. Mem., Chem. Ser., 8 (1926), No. 9, pp. 153–187, figs. 4*).—In two digestion experiments of 14 and 10 days, respectively, with 8 cows in each experiment receiving a ration of fresh alfalfa, silage, hay, brewers' grains, peanut cake, wheat bran, cottonseed meal, and grams husk, the average digestibility of the protein was found to be decidedly less and the organic matter slightly less, but the digestibility of fiber and fat was distinctly greater than that computed according to Henry and Morrison's table. The ration used contained considerably more protein than is ordinarily recommended by American standards. The computed protein requirement per pound of milk was 0.092 lb., which is considerably higher than that allowed by American standards. This difference is explained as due to the lower digestible protein content of the roughages used and a lower digestibility of the protein by the cows in this experiment.

Raising dairy calves, A. R. Merrill (*Conn. Agr. Col. Ext. Bul. 99 (1926), pp. 16, figs. 7*).—Brief directions for raising dairy calves, with discussions of milk substitutes or calf meals and other related information.

The effect of fat in the ration upon the percentage fat content of the milk, W. B. Nevens, M. B. Alleman, and L. T. Peck (*Jour. Dairy Sci., 9 (1926), No. 4, pp. 307–345, figs. 12*).—Four series of experiments with feeding periods varying in length from 2 days to 5 weeks were conducted at the Illinois Experiment Station to study the effect of rations high in oil content on the composition of the milk, and to establish the factor responsible for the changes in the butterfat content of the milk noted in the second series of experiments.

Throughout the experimental work the cows were fed sufficient roughage to satisfy maintenance requirements. The roughage consisted of corn silage and alfalfa hay in the first and second series of experiments, while dried beet pulp soaked replaced part of the silage and hay in the third and fourth series.

Rations containing a large percentage of oil were prepared by the addition of such substances as sunflower seed, soy bean seed, high oil corn, flaxseed, and peanuts. These rations were compared with mixtures low in oil or with the regular herd ration which was moderately high in its fat content. Particular attention was given in the third and fourth series of experiments to the estimated protein and digestible nutrient requirements of the animals on the rations compared.

In the first series mixtures of soy bean seed, sunflower seed, and high oil corn when fed to 2 cows did not appear to stimulate milk production, and any effects on the butterfat test were not apparent in weekly composite samples.

In the second series of experiments 4 cows were fed in 5 alternate periods with the herd ration and the mixtures of sunflower seed, high oil corn, and soy bean seed. The latter ration increased the butterfat test of the milk from 8 to 18 per cent, with slight changes in the percentage of total solids in the same direction.

In the 3 portions of the third experiment 6, 9, and 4 cows, respectively, were fed rations including soy bean oil meal, linseed oil meal, and peanut oil meal during the first and third periods, while these feeds were replaced, respectively, by soy bean meal, flaxseed meal, and peanut meal during the second period. The soy bean feeding did not appear to produce any significant increase in the butterfat test of the milk, but flaxseed produced an increase as great as 20 per cent in the fat test, and an average increase of over 10 per cent as compared with linseed oil meal. Peanuts produced an increase as high as 18 per cent and an average of 9 per cent over the fat test of the milk when peanut oil meal was supplied.

In the fourth experiment 4 to 6 cows were fed in 5 periods with either flaxseed, peanut, or soy bean oil meal in the first, third, and fifth periods, with flaxseed, peanut, or soy bean meal in the second period, and with the oil meal plus oil from the same seed in the fourth period. Four cows were used in the experiments with flaxseed and 5 each with peanuts and soy beans. As in the third series of trials, there was little difference between the soy beans and soy bean oil meal, but flaxseed meal and peanut meal or linseed oil or peanut oil added to the respective oil meals produced distinct increases in the fat tests.

From the results of these experiments the authors conclude that the percentage of fat in the milk has been materially increased by the feeding of rations high in oil. The oil may be supplied as the ground whole seed or as oil extracted from the seeds.

The four series of experiments indicate that it is the oil itself and not the stimulation due to a large excess of energy in the ration, nor to a so-called specific effect of feeds which may be closely associated with the oil, that is responsible for the increase in the fat test. Some latent effect of the high oil rations was apparent for from 12 to 36 hours after changes were made in the ration, and a similar time was required for the appearance of the effect of low oil rations. The greatest effect of high oil rations appeared to occur within the first 2 or 3 days. A decline tended to follow.

Common difficulties in farm dairying, their causes and remedies, C. N. Shepardson (*Colo. Agr. Col. Ext. [Bul.] 246A (1926), pp. 12*).—A popular discussion of the causes of variations in the fat test of milk and cream, defects in flavor and physical condition, and difficulties in churning butter.

How to run a milk business, H. W. Paine and A. S. Bonney (*Milwaukee, Wis.: Olsen Pub. Co., 1926, pp. 91*).—Brief suggestions for the milk dealer.

Milk clarifiers and milk filters, T. M. Olson (*South Dakota Sta. Rpt. 1926, pp. 16, 17*).—Numerous tests with a clarifier and filter indicated that there is very little, if any, difference in the keeping quality of milk that has been clarified and pasteurized, and milk that has been pasteurized and filtered. Acidity tests likewise showed little difference. The time of pasteurization exerted a much more noticeable effect. Bacterial counts, methylene blue reductase tests, and Cooledge hydrogen-ion determinations substantiated these results. The clarifier, however, reduced the cell counts by more than 50 per cent, while the filter exerted no appreciable effect on the number of cellular elements in the milk.

Sediment tests were in favor of the clarified samples. Cream line, however, seemed least affected by the filter, as clarification at 80° F. caused a slight decrease in the cream line. The time required in assembling, dismounting, washing, and sterilizing the filter was considerably less than the time required for the same operation with the clarifier.

Canadian creamery buttermaking, W. F. Jones (*Canada Dept. Agr. Bul. 70, n. ser. (1926), pp. 30*).—Recommended methods of churning, washing, working,

and salting, and packing and printing butter are discussed, with special reference to defects likely to result from faulty methods or improperly cleaned equipment.

Shrinkage of print butter, E. S. Guthrie (*Jour. Dairy Sci., 9 (1926), No. 4, pp. 346–350*).—Tests of the effect of the amount of working of butter on the shrinkage of the prints in storage are reported from the New York Cornell Experiment Station.

In one test butter held in storage for 155 days at 45 to 50° F., which had been worked for 50 revolutions in a Victor churn with one set of rolls, lost an average of $\frac{2.64}{32}$ oz. per print, while similar lots worked 68 revolutions lost $\frac{1.22}{32}$ oz. per print. In a second test, using a Victor churn with two sets of rolls, butter worked sufficiently to give a uniform color and stored for about 8 months at 0 to +5° F. lost an average of $\frac{19.75}{32}$ oz., while other samples worked 10 additional revolutions in a similar type of churn lost only $\frac{2.31}{32}$ oz.

The author believes that "this limited study indicates that the shrinkage of butter by evaporation and leakage can be largely controlled by thoroughly incorporating the moisture in the fat in the working process."

The relation of bacteria to the quality of graded butter, W. Sadler, R. L. Vollum, and W. C. Cameron (*Canada Natl. Research Council Rpt. 16 (1926), pp. 23*).—The bacterial content of 31 samples of butter from 7 creameries submitted to the 1919 Grading Competition of the British Columbia Dairymen's Association was determined, and 140 of the most prevalent types of bacteria were isolated. A study of the results indicated that the flora of the butter from the respective creameries was distinctive, but there was no relation between the bacterial content and the award made by the judges. Since a large number of the organisms were killed by pasteurization, it is supposed that approximately 80 per cent of the organisms found gained access to the cream and butter subsequent to pasteurization.

Studies of the conditions at 2 creameries producing off-flavored butter indicated that the conditions were due to contamination after pasteurizing the cream. In one case the source appeared to be in the water supply, while at the other creamery the wash water was stored in a tank which had not been thoroughly cleaned.

Appendixes are given on The Suggested Control of Creamery Operations by the *coli* Determinations, by W. Sadler, and a Report on Experimental Butter, by W. Sadler and W. C. Cameron.

Cottage cheese manufacture in dairy plants, E. L. Reichart and H. P. Davis (*Nebraska Sta. Bul. 217 (1927), pp. 16, figs. 7*).—A method of manufacturing cottage cheese which has proved very successful at the University of Nebraska is described. The necessary equipment, the making of starters, and the correct methods of handling, packing, and selling of cottage cheese are discussed. Defects in flavor, body, and texture and suggested remedies are described.

A defect of pimento cheese, D. H. Warren (*Jour. Dairy Sci., 9 (1926), No. 4, pp. 351–358*).—In studies at the Bureau of Dairying, U. S. D. A., of the cause of the development of a sharply acid and bitter flavor in pimento cheese on standing, preliminary investigations pointed toward an anaerobic spore-forming, Gram-positive, motile bacillus similar to *Clostridium butyricum*.

To test this hypothesis cheese was made from milk sterilized in the autoclave and divided into 3 lots, each of which was inoculated with 0.5 per cent of a 24-hour-old culture of *Streptococcus lactis*. Two of the lots were further inoculated with spores of the anaerobe, which in one case had been heated (shocked) for the promotion of more rapid growth. The flavor of

the cheese remained clean and mildly acid throughout the 6 days of the experiment in those samples inoculated with *S. lactis* only, but by the fourth day a noticeably bitter taste appeared in the lots inoculated with spore-forming organism. The defect appeared more rapidly and was more pronounced in the lot inoculated with the shocked spores.

Analyses of the cheese showed that there was an increase in volatile acids of 16 and 8.8 per cent in those lots inoculated with shocked and unshocked spores, respectively, and 4.7 per cent in the cheese inoculated with *S. lactis* only.

The cultural characterictics of the spore-forming organism are briefly noted.

VETERINARY MEDICINE

A textbook of pathology, J. M. Beattie and W. E. C. Dickson (*London: William Heinemann, 1926, 3 ed., pp. XXV+1103, pls. 17, figs. 499*).—This is a largely rewitten edition of a work, based upon the teaching of the Edinburgh school, which first appeared in 1908. Part 1 (pp. 1–496) deals with general pathology, and part 2 (pp. 497–1067) with special pathology. Recommendations made by the Chemical and Physiological Societies of Great Britain as to the nomenclature of albuminous substances and Adami's classification of tumors[5] are given in appendixes.

Histological technique for normal tissues, morbid changes, and the identification of parasites, H. M. Carleton (*London and New York: Humphrey Milford, Oxford Univ. Press, 1926, pp XV+398, figs. 17*).—This work presents in compact form the chief methods employed in the microscopic examination of mammalian organs. Part 1 of this work (pp. 3–23) gives the structure and composition of the cell in relation to histological technique; part 2 (pp. 27–150) type methods of normal histology; part 3 (pp. 153–195) accessory methods of examination; part 4 (pp. 199–300) methods for special organs, tissues, and cell components; and part 5 (pp. 303–366) technique of morbid histology, including methods for the identification of microorganisms and other parasites.

An attempt to increase the virulence of a micro-organism by method of culture, K. R. K. Iyengar (*Indian Jour. Med. Research, 13 (1926), No. 3, pp. 555–557*).—The author concludes that the virulence of *Bacillus avisepticus* can not be increased without animal subpassage, and that the same conclusion applies to other organisms as well.

Human protozoology, R. W. Hegner and W. H. Taliaferro (*New York: Macmillan Co., 1925, pp. XIX+597, pls. 2, figs. 197*).—The several chapters of this work deal with the subject as follows: Introduction to the organization of the Protozoa (pp. 1–18), a general consideration of the Sarcodina (pp. 19–46), the ectozoic and entozoic Sarcodina (pp. 47–90), a general consideration of the Mastigophora (pp. 91–125), the haemoflagellates and allied forms (pp. 126–200), the intestinal flagellates (pp. 201–265), a general consideration of the Sporozoa (pp. 266–269), the gregarines and coccidia (pp. 270–292), the order Haemosporidia exclusive of the malarial parasites (pp. 293–312), the malarial parasites (pp. 313–360), the Neosporidia (pp. 361–377), a general consideration of the Infusoria (pp. 378–408), ectozoic and entozoic Infusoria (pp. 409–447), genetics and physiology of reproduction in the Protozoa (pp. 448–480), and the diagnosis of the intestinal Protozoa (pp. 481–513). A classified bibliography is included (pp. 515–566).

[5] On the Classification of Tumours, J. G. Adami. Jour. Path. and Bact., 8 (1902), 243–55.

The ultra-microscopic viruses, I, II, G. M. FINDLAY and R. J. LUDFORD (*Brit. Jour. Expt. Path., 7 (1926), No. 5, pp. 223–264, figs. 66*).—In the first part of this account (pp. 223–255) the authors deal with cell inclusions associated with certain ultra-microscopic diseases, in which a pictographic review is included. The references to the literature are presented under the headings of 23 different diseases.

In part 2 (pp. 256–264), the cytology of fowl-pox is dealt with.

Symposium on "filterable viruses" (*Jour. Bact., 13 (1927), No. 1, pp. 16–25*).—The first part of the symposium on filterable viruses held at the annual meeting of the Society of American Bacteriologists at Philadelphia in 1926 was contributed to by the following members: Filterable Viruses—A Critical Review, by T. M. Rivers (pp. 16–20); The Nature and Significance of Cellular Inclusion Bodies in Diseases Due to Filterable Viruses, by E. V. Cowdry (pp. 20, 21); Recent Research on Foot-and-Mouth Disease, with Special Reference to the Work of the American Commission, by H. W. Schoening (pp. 21–23); Some Characteristics of Virus Diseases of Plants, by L. O. Kunkel (pp. 23, 24); and Studies on Vaccinia Virus, by E. H. Oppenheimer (pp. 24, 25).

Agglutinin absorption, C. KRUMWIEDE, G. COOPER, and D. J. PROVOST (*Jour. Immunol., 10 (1925), No. 1, pp. 55–239, figs. 2*).—In summarizing this report of investigations and review of the literature, the authors point out that there is no means of measuring the specific agglutinin content of a serum except by using the bacterial type which is known to have stimulated the production of the agglutinins in a serum, even though this means may not always be adequate. "There is no basic validity, therefore, in a procedure which assumes the reliability of determining the infecting bacterium or bacteria by testing the absorptive capacity of several cultures on the agglutinins present in the patient's serum for each of such cultures. Such a procedure does not take into account all the possible alternatives. The observation of the character of the clumping and the use of the specific component for test purposes may give strongly suggestive results. The probable alternatives in such methods are discussed."

Relation of anaphylaxis to immunity.—I, Passive desensitization in dogs, W. H. MANWARING, P. W. SHUMAKER, P. W. WRIGHT, D. L. REEVES, and H. B. MOY (*Jour. Immunol., 13 (1927), No. 1, pp. 59–62*).—In work at Stanford University the authors find that the blood of an actively immunized dog contains no antibody that serves as a demonstrable circulating defense to hypersensitize fixed tissues. "The immune blood, however, does contain a desensitizing substance, capable of causing complete desensitization of hypersensitive fixed tissues. This desensitization is effected only after a latent period of about 48 hours. All phenomena of passive desensitization or passive immunization thus far studied in dogs may be accounted for as a result of the action of this desensitizing antibody. As pointed out in previous papers, there is conclusive evidence that in dogs the sensitizing antibody and desensitizing antibody are of different chemical composition, and that neither of these substances is identical with the specific precipitin of our test tube reactions."

The nature of bacteriophage, E. B. MCKINLEY and M. HOLDEN (*Jour. Infect. Diseases, 39 (1926), No. 6, pp. 451–456, pls. 2*).—The authors concur with d'Herelle in the view that bacteriophage is a particulate substance. "Being particulate does not in and of itself imply its living nature, though its power of multiplication and adaptation are strong arguments for it. We question the theory of its being an ultramicroscopic virus in that adequate proof is lacking for this conception. However, it is possible to conceive of an ultramicroscopic particulate substance, diastatic in its action, granular in

form and inanimate, which may be derived from the bacterial cell during a stage in its life cycle as a result of the influence tissue cells of the host have had upon it. Bordet has called this 'hereditary vitiation,' and it may well be. The susceptibility of the bacteriophage to the action of ultra-violet rays is suggestive of its living nature, though it is well known that enzymes are also destroyed by them and such a criterion would not serve in proving this point."

Studies on the metabolism of Bact. abortus-melitensis-bronchisepticum-alcaligines group.—I, Nitrogen metabolism, J. G. McAlpine and C. A. Slanetz (*Jour. Bact., 13 (1927), No. 1, pp. 11–13*).—This is a contribution from the Connecticut Storrs Experiment Station in which 8 strains of *Bacterium abortus*, 5 of bovine and 3 of porcine origin, 5 strains of *B. melitensis* from various sources, 2 strains of *B. bronchisepticum*, and 2 strains of *B. alcaligines* were studied. The preliminary experiments indicate a decided difference in the metabolic activities of *B. melitensis* and *B. abortus* of bovine origin, at least in the strains used in the present study. Cultures of *B. abortus* from porcine sources resembled more closely *B. melitensis* than the bovine strains of *B. abortus*.

Distribution of the spores of Bacillus botulinus and Bacillus tetani in the soil.—I, In Maryland, S. R. Damon and L. B. Payabal (*Jour. Infect. Diseases, 39 (1926), No. 6, pp. 491–501, figs. 2*).—Out of 62 soil samples obtained from the various localities throughout Maryland, 4 contained toxin-producing organisms that could not be identified by antitoxin protection tests. *B. tetani* was present alone in 6 samples, *B. botulinus*, type A, was present alone in 8, *B. botulinus*, type B, was present alone in 25, and *B. botulinus*, type C, was present alone in 5 samples. *B. botulinus*, types A and C, were present together in 4, and types B and C were present together in 5 samples. The three types of *B. botulinus* were not found together, and neither were *B. botulinus* and *B. tetani* found together in any single sample. The sources of the soil samples and a comparison of the results with those of similar surveys by workers in California and Illinois are shown in illustrations.

Meningitis due to B. enteritidis Gaertner, G. Stuart and K. S. Krikorian (*Jour. Hyg. [London], 25 (1926), No. 2, pp. 160–164, fig. 1*).—In this contribution from the Central Laboratories, Department of Health, Government of Palestine, the authors report upon a case of meningitis in an 11-year-old boy. Agglutination tests of the causative organism showed it to be of the *B. enteritidis* Gaertner type, with fully developed labile antigen. The absorption tests showed that this organism and typical *B. enteritidis* Gaertner possess identical labile and stable receptor apparatus.

Undulant fever as a public health problem, T. G. Hull and L. A. Black (*Jour. Amer. Med. Assoc., 88 (1927), No. 7, pp. 463, 464*).—Following a brief reference to the literature on the subject, the authors report upon agglutination tests with *Bruccila abortus* antigen made on blood serums sent in for Widal tests at the laboratories at Springfield, Ill. Among 69 specimens of blood from fever patients who consistently gave negative Widal reactions, agglutination reactions with *B. abortus* antigen were positive in 5 in dilutions of 1:200 or greater. The histories of 4 of the 5 cases are reported, 3 of which gave a positive agglutination reaction at dilutions of 1:500. In the macroscopic test, used in dilutions ranging from 1:25 to 1:500, 5 others agglutinated in 1:25 only and a sixth agglutinated in 1:50. The authors point out that undulant fever seems to be much more common than is ordinarily suspected.

The tuberculosis of domestic Carnivora, G. Lesbouyries (*La Tuberculose des Carnivores Domestiques. Paris: Vigot Bros., 1926, pp. 140, pls. 2, figs. 13*).—Following a brief introduction, the subject is dealt with in five parts, namely,

frequency of tuberculosis (pp. 3–5), etiology and pathogenesis (pp. 6–17), lesions and symptoms (pp. 18–81), diagnosis (pp. 82–111), and treatment (pp. 113–125). A classified bibliography of nine pages is included.

Coccidiosis in feeder cattle, E. R. Frank (*Jour. Amer. Vet. Med. Assoc., 69 (1926), No. 6, pp. 729–733*).—This is a contribution from the Kansas Experiment Station which deals briefly with life cycle, infection, diagnosis, and case reports. Reference is made to cases among beef cattle recorded at the veterinary hospital in 1924, 1925, and 1926, from which it is concluded that the degree of transmissibility of the disease is very low.

Parasites and parasitic diseases of goats, M. C. Hall (*Goat World, 10 (1925), Nos. 6, pp. 1–3; 7, pp. 8–11, figs. 4; 8, pp. 5–8, figs. 3; 9, pp. 10–13; 10, pp. 3–6; 11, pp. 4–7*).—This is a practical summary of information on the parasites and parasitic diseases of goats, both external and internal.

Annual report of camel specialist for the year 1923–24, K. Singh (*[Punjab] Camel Specialist Ann. Rpt. 1923–24, pp. 3+3+9*).—This includes reports on the treatment of surra by the Cross method, experiments on treatment of surra in ponies and donkeys, etc.

Tick paralysis in pigs (*Queensland Agr. Jour., 26 (1926), No. 6, pp. 550, 551*).—A brief account is given of paralysis in pigs caused by *Ixodes holocylus*, which is comparatively common along the coastal districts of New South Wales and Queensland.

Nematodes belonging to the genus Setaria parasitic in the eyes of horses, B. Schwartz (*North Amer. Vet., 8 (1927), No. 2, pp. 24–27, figs 2*).—The author reports upon cases of Setaria (Filaria) from the eyes of horses which he has observed, differentiation of species of Setaria from the eyes of horses, the injuries produced by Setaria in the eye of the horse, and the life history of Setaria.

Notes upon the action of mercurochrome on horses, W. L. Williams (*North Amer. Vet., 8 (1927), No. 1, pp. 51–59*).—The author's observations indicate that the intravenous administration of mercurochrome in 1 per cent aqueous solution in doses of 4 to 5 mg. per kilogram of body weight is readily tolerated by the horse and produces no symptoms of notable distress. There appear to be marked variations in the effect of mercurochrome according to the temperament of the animal, those of nervous temperament, including thoroughbreds and trotters, being definitely more susceptible than draft types. The horse quickly acquires tolerance to the drug, and successive doses may be increased.

Animal feeding experiments with Bacterium pullorum: The toxicity of infected eggs, L. F. Rettger, C. A. Slanetz, and J. G. McAlpine (*Connecticut Storrs Sta. Bul. 140 (1926), pp. 97–110, figs. 3*).—This is a report of investigations conducted in continuation of those by Rettger, Hull, and Sturges, previously noted (E. S. R., 35, p. 683). In the present investigation 12 kittens and 24 young rabbits were employed in feeding experiments, the details of which are given. The results obtained are considered to be quite in accord with the earlier observations and to show that large numbers of *B. pullorum*, when administered by mouth to young kittens and rabbits, cause disturbances in them which resemble in some measure at least those that are commonly associated with bacterial food poisoning. All of the kittens recovered from the effects of the *B. pullorum* feeding, but 18 of the 21 infected rabbits died, and from the blood of each of those which succumbed *B. pullorum* was recovered without difficulty. All of the three control rabbits lived and were in apparently normal condition throughout the investigation. Charts showing the influence of *B. pullorum* feeding on the temperature of rabbits and tables showing the

Coccidiosis and bacillary white diarrhea in chicks, E. L. BRUNETT and R. C. BRADLEY (*N. Y. Agr. Col. (Cornell) Ext. Bul. 148 (1926), pp. 18, figs. 5*).—This is a practical summary of information.

Investigation on a diarrhea in young chicks in Japan, N. NAKAMURA (*Jour. Japan. Soc. Vet. Sci., 1 (1922), No. 2, pp. 93–100, pl. 1*).—Investigations of the disease among chicks in Japan known as "Babatare" have led to the conclusion that it is not identical with the white diarrhea of chicks in other countries, and that the anaerobic bacillus isolated from the intestinal contents of the affected chicks was the causative organism.

Vaccination of poultry against diphtheria and fowl pox (contagious epithelioma) with antidiphtherine [trans. title], T. VAN HEELSBERGEN (*Schweiz. Arch. Tierheilk., 67 (1925), No. 13, pp. 333–338, fig. 1; abs. in Vet. Rec., 7 (1927), No. 5, p. 114*).—It is pointed out that in the vaccination of poultry with the antidiptherine of de Blieck and van Heelsbergen, as previously noted (E. S. R., 53, p. 785), during the winter of 1924–25, 200,000 fowls were vaccinated without a single accident. Good results were also obtained from the treatment of fowls actually suffering from the disease. Observations made at several poultry experiment stations and on large farms are said to have shown that the immunity acquired was still active after two or three years. It was observed that the number of eggs from fowls vaccinated during the laying season was not diminished.

Iodine on the poultry farm, W. L. CHANDLER (*Poultry Sci., 6 (1926), No. 1, pp. 31–35*).—The author points out that iodine has two important uses on poultry farms, the first being that of dosing the birds for worms, and the other the treatment of poultry houses and runways for the destruction of worm eggs and larvae and the cysts of coccidia.

Diseases and treatment of the rabbit, M. W. MEEK (*Arcadia, Calif.: Natl. Assoc. Rabbit Indus., 1926, pp. 77, figs. 20*).—This is a practical summary of information on the diseases of the rabbit.

AGRICULTURAL ENGINEERING

Agricultural engineering and its place in Canadian agriculture, L. G. HEIMPEL (*Sci. Agr., 6 (1925), No. 2, pp. 41–46, fig. 1*).—In a contribution from Macdonald College, Quebec, an analysis is presented of the field of agricultural engineering in Canadian agriculture. Special attention is drawn to the relation of this work to practically all of the recognized branches of agriculture, and to the factors limiting the development of the work in Canada.

Drainage by means of pumping from wells in Salt River Valley, Arizona, J. C. MARR (*U. S. Dept. Agr. Bul. 1456 (1926), pp. 22, pls. 3, figs. 15*).—The practice is described, and an analytical study of some of the results obtained in conjunction with the existing conditions is presented.

Test borings in the Salt River Valley project showed that about half of the project is underlaid by a coarse water-bearing formation from which water may be pumped. The use of electrically driven pumps in wells located in damaged areas was successful in reclaiming water-logged land and in checking the rise of ground water in sections not yet damaged. The pumped water has also been used very largely to augment the supply available for irrigation. The cost of the completed drainage system for 203,000 acres of cultivated land was approximately $5.20 per acre.

Plants as indicators of ground water, O. E. MEINZER (*Jour. Wash. Acad. Sci., 16 (1926), No. 21, pp. 553–564*).—In a contribution from the U. S. Geological Survey a study is presented of the desert phreatophytes, and data are pre-

sented on the general limits of the depth to the water table indicated by the principal phreatophytes in the areas investigated.

These indicate that the species investigated, with the possible exception of pickleweed, may grow where the upper layer of ground water contains only small amounts of mineral matter and is of good quality. Thus of 13 samples of ground water obtained in Big Smoky and Ralston Valleys, Nevada, at points where salt grass was growing, 11 samples contained less than 1,000 parts per million of total solids, 8 contained less than 500 parts, and 5 less than 300 parts. More than half contained less than 35 parts per million of chloride. On the other hand, the data show that all these species may be found growing where the ground water is highly mineralized, even mesquite not being an exception.

The soil dynamics problem, E. G. McKibben (*Agr. Engin.*, 7 (1926), No. 12, pp. 412, 413).—In a contribution from the California Experiment Station an analysis is presented of those factors, both past and present, which make the soil what it is, and of the resultant properties which affect its utilization in agriculture. On the basis of this analysis the soil dynamics situation is divided into three major problems which include (1) the determination of those dynamic properties of soils affecting their drainage, irrigation, tillage, traction, and use as a foundation and building material, and the effect of changing chemical, physical, and biological conditions upon these dynamic properties, (2) the determination of what should be done to the soil and when it should be done, and (3) the determination of the best methods and machines for accomplishing the desired results.

Earth pressures on culvert pipes, G. M. Braune (*U. S. Dept. Agr., Public Roads*, 7 (1927), No. 11, pp. 222–229, figs. 18).—The progress results of a series of tests being conducted at the University of North Carolina to determine earth pressures on culvert pipes, using conditions conforming to practice as closely as possible, are reported.

Tests of four sections of 30-in. cast iron pipe, 2.5 ft. long and 1 in. thick, so placed as to permit a 50 per cent projection, showed that the earth pressure on the test pipe was 84 per cent of the weight of the earth prism immediately over the pipe. This ratio remained practically constant for the entire height of the fill except for the first 4 ft., where the earth pressures were greater than the weight of the earth prism.

In a test using a 50 per cent projection and a clay fill, the pressures were found upon completion of the embankment to be less than for the projection condition, the ratio of the pressure to the weight of the prism over the pipe decreasing as the fill was raised. The pressures decreased from March to the middle of August, and sudden variations in the weather had but little effect upon the pressure.

Combined concrete and timber in flexure, G. D. Burr (*Wash. [State] Univ., Engin. Expt. Sta. Bul. 37* (1926), pp. 22, figs. 15).—The results of studies of concrete and timber in flexure are reported, the results of which indicate that timber may be made to take the tension and concrete the compression in a structural member, thus using both materials to their greatest advantage. It was found that concrete and timber combined as a single member will produce a beam several times stronger than the same quantity of materials not so combined. Increased stiffness is secured, thus reducing deflections and vibration. It was found that adding the concrete to the timber produced a beam nine times more rigid than the original timber.

Rough timber may be used, resulting in a twofold saving. The strength is greater and the cost may be reduced somewhat by avoiding the surfacing operation. It was found that the irregular dimensions of the unsurfaced ma-

terial are not objectionable, since the plasticity of the fresh concrete allows for the irregularities.

Form cost is small by reason of the small amount of form work required, the simplicity of the forms, and their adaptability to re-use. This is brought about by the fact that the timber provides the strength to carry the dead load while the concrete is setting.

The conclusion is drawn, however, that this study can not be regarded as completed. There are some factors which can be determined only by the actual use of this type of construction for long periods of time or else by exhaustive experiments.

The use of explosives on the farm, A. J. Schwantes (*Minn. Univ. Agr. Ext. Spec. Bul. 110* (*1926*), *pp. 20, figs. 18*).—Practical information on the subject is presented, with particular reference to the use of explosives for stone and stump removal under Minnesota conditions.

Public Roads, [January, 1927] (*U. S. Dept. Agr., Public Roads,* 7 (*1927*), *No. 11, pp. 209–232+[2], figs. 20*).—This number of this periodical contains the apportionment of Federal-aid funds for the fiscal year ending June 30, 1928, and the status of Federal-aid highway construction as of December 31, 1926, together with the following articles: The Collection and Disposition of Motor Vehicle Revenues, by H. R. Trumbower; Earth Pressures on Culvert Pipes, by G. M. Braune (see p. 680); The Downward Kick of the Rear Wheels of Vehicles in Starting from Rest to Motion, by T. K. A. Hendrick, and Motor Truck Impact Tests Now in Progress.

Ultra-violet spectroscopy of flames of motor fuels—preliminary experimental survey, G. L. Clark and W. C. Thee (*Indus. and Engin. Chem., 18* (*1926*), *No. 5, pp. 528–531, figs. 2*).—Preliminary studies conducted at the Massachusetts Institute of Technology are reported in which the ultra-violet spectra were photographed of the detonation, explosion, and combustion flames in an engine of several commercial brands of gasoline, of gasoline containing butyl nitrite, a detonation inducer, tetraethyl lead, a detonation suppressor, and of benzene and alcohol.

The spectra of detonation, explosion, and combustion were found to be different, the first being characterized by a strongly banded structure. Both tetraethyl lead and butyl nitrite were found to affect the spectra. The former suppressed the strong bands and shortened the ultra-violet, while the latter even accentuates the intensity in the far ultra-violet, thus throwing some light on the radiation theory of detonation control.

The strong lead lines and the absence of lead compound bands showed that the metallic lead atoms or the process of decomposition of the tetraethyl lead molecule is the effective agent in the reaction propagation, and that combination with the bromine introduced as ethyl bromide takes place subsequently to the oxidation reaction. The copper lines from the plug spark appeared as emission lines in the presence of lead in the vapor, but as absorption lines in its absence.

The results in general are considered to be sufficiently important and clear to warrant thoroughly quantitative investigation with the spectroscope data correlated with known composition of fuels, pressures, reaction rates, and amounts of detonation.

The gas engine on the farm.—III, Running troubles and their remedy, F. G. Behrends and F. L. Fairbanks (*N. Y. Agr. Col.* (*Cornell*) *Ext. Bul. 147* (*1926*), *pp. 48, figs. 26*).—Practical information on the subject is presented.

Report of investigational work on the use of electricity in agriculture by the farm mechanics department of University of Illinois, E. W. Leh-

MANN (*Springfield, Ill.: R. V. Prather, 1926, pp. 16, figs. 2*).—A brief description is given of the work on the subject being done by the Illinois Experiment Station, and some of the progress results are briefly presented.

Hydro-electric power in Washington.—Part II, A bibliography of technical papers, 1878–1925, C. E. MAGNUSSON (*Wash. [State] Univ., Engin. Expt. Sta. Bul. 36 (1926), pp. 143, figs. 2*).—A bibliography of technical papers on the subject is presented (E. S. R., 52, p. 182).

Testing draft horses, E. V. COLLINS and A. B. CAINE (*Iowa Sta. Bul. 240 (1926), pp. 193–223, figs. 27*).—The development of methods and apparatus for testing the pulling power of horses is outlined, and the results of actual draft tests are presented and discussed in the first part of the publication. A second part presents the results of a study of the horse as a motor (E. S. R., 55, p. 579).

The experiments as outlined required a steady, constant pull, and the load did not vary either going up or down small hills. Two years' studies demonstrated clearly that it is possible for horses weighing from 1,500 to 1,900 lbs. or more to continuously exert 1 h. p. or more for periods longer than 1 day. It is also possible for a well-trained horse to exert an overload of over 1,000 per cent for a short time.

Daily observations of horses working during all kinds of summer weather indicated that humid days are much harder on them than dry, hot days. The correct fitting of collars and the proper care of shoulders are also essential if maximum work is to be obtained. If it is necessary to work horses hard during rainy weather, housings should be provided to keep the collars and shoulders as dry as possible.

Three years of experimental work also demonstrated that it is possible for horses to exert a tractive effort of from one-tenth to one-eighth of their own weight, and to travel a total of 20 miles per day without undue fatigue.

Characteristics of full and partial journal bearings, H. A. S. HOWARTH (*Indus. and Engin. Chem., 18 (1926), No. 5, pp. 453–460, figs. 18*).—An analysis is presented of bearings bored with running clearance and bearings fitted carefully to the journal. The first type includes full or complete bearings, central partial bearings in which the line of action of the resultant load bisects the bearing angle, and offset partial bearings in which the line of action of the resultant load intersects the bearing surface usually more than half way from the leading edge.

Graphical studies of these types are reported, the purpose being to provide a complete set of fundamental laws which must govern the actual lubrication of all plain journal bearings. The bearing characteristics as given represent ideal conditions in that they show the maximum film thickness which may be realized for a given load. These laws may serve as a guide in the study of actual bearings in which such factors as end leakage and surface roughness play a modifying part and prevent the carrying power from being as great as in the ideal case.

The question as to the advantages of employing two or more pivoted segments instead of a single partial bearing to support a journal is cited as an example of the use of these laws. It is shown that the film is thinner in the case of the bearing of two segments, the total arc of each bearing and other conditions being equal. In a similar manner a 3-segmented bearing is inferior to one of two segments.

The kinematics and dynamics of the wheel type farm tractor, E. G. MCKIBBEN (*Agr. Engin., 8 (1927), No. 1, pp. 15, 16, fig. 1*).—This is the first of a series of articles on the subject, which are based on a study conducted at the

California Experiment Station. This number of the series presents the results of a study of the possible motions of a tractor. An analysis is given of rectilinear and curvilinear motion and of instantaneous axis of rotation.

Root cutting as an aid in harvesting grain sorghums with a "combine," J. P. CONRAD (*Jour. Amer. Soc. Agron., 18 (1926), No. 9, pp. 729–742, figs. 3.*)—Studies conducted at the California Experiment Station are reported from which the conclusion was drawn that the difficulty of harvest is one of the important reasons why grain sorghums are not more widely planted. Root cutting preparatory to harvesting with a combine was found to have many theoretical advantages over systems of harvesting now used. Root cutting of grain sorghum plants was accomplished with heavy horizontal blades attached to a heavy orchard cultivator and running beneath the crowns of the plants. Where all of the roots were cut at 9 in. or less from the surface the plants dried out rapidly except when irrigated immediately afterward. No plant whose roots were cut at least 5 in. from the surface went down due to the overturning of the sod. Only a very few plants remained standing when cut at 2.5 in. or less from the surface. Between 90 and 95 per cent of the heads were secured by harvesting with a combine after root cutting.

Farm building plans, H. B. WHITE and M. G. JACOBSON (*Minn. Univ. Agr. Ext. Spec. Bul. 111 (1926), pp. 8, figs. 3*).—A list of farm building plans available from the Minnesota Experiment Station is presented.

The Gothic barn roof with sprung rafters, F. E. FOGLE (*Agr. Engin., 8 (1927) No. 1, pp. 13, 14, figs. 5*).—In a contribution from the Michigan Experiment Station an analysis is presented of the Gothic barn roof with sprung rafters. It is stated that when built on Shawver truss frames the sprung rafter Gothic roof is very rigid, and since the rafters are supported near their middle there is much less liability of the roof becoming uneven as compared with the self-supporting frame. It is noted that a sprung roof invariably shows some unevenness of its surface due to the practical impossibility of maintaining such a high degree of uniformity in workmanship and material as to prevent minor variations in curvature, but it is considered apparent that such irregularities do not of necessity indicate structural weakness. With reference to curvature, it is considered good practice to use two-thirds or three-fourths of the width of the barn as the radius of rafter curvature and to locate the center of the arc about 3 ft. below the top of the plate.

Automatic control of natural draft ventilation of stables, J. L. STRAHAN (*Agr. Engin., 8 (1927), No. 1, pp. 9, 10, figs. 2*).—This is an abstract of a paper presented at the twentieth annual meeting of the American Society of Agricultural Engineers at Lake Tahoe, Calif., in June, 1926.

The conclusion is drawn that dampers should be omitted entirely from outtake flues, and that the latter should be made smooth on the inside. This transfers the entire burden of control to the intakes. A device is illustrated and described which adds to a back-draft control device the function of regulating the volume of air flow in the normal or proper direction, which function was previously left entirely to hand dampers. The purpose of this device is to keep the volume of air flow automatically within a specified maximum, regardless of a wide variation in draft-producing conditions.

Aside from the galvanized-iron housing, with its removable cover, the essential parts of the device are the aluminum vane or damper supported by a suitable transverse shaft and bearings, the counter weight, and the control weight. The damper has two closing positions, one being the position to prevent back drafting and the other the fully closed position for preventing excessive flow in a normal direction.

The question is raised as to whether thermostatic control will in practice be as effective a means of minimizing inside temperature variations as a device such as the one described, which operates as a function of air flow velocity in the ducts.

Hog houses and equipment, H. P. Twitchell (*Ohio Agr. Col. Ext. Bul. 57 [1927], pp. 24, figs. 18*).—Practical information, working drawings, and bills of material for hog houses and equipment adapted to Ohio conditions are presented.

Artificial lighting for poultry houses, R. E. Cray (*Ohio Agr. Col. Ext. Bul. 56 [1926], pp. 16, figs. 6*).—The results of experiments on the artificial lighting of poultry houses to increase egg production are reported, and information is presented on the proper equipment for this purpose.

It has been found that electric light is the most efficient, easiest to operate, and best all-round kind of light for poultry houses. One 40-watt bulb should be used for each 200 sq. ft. of floor space, and the lights should not be placed more than 10 ft. apart.

The best results have been secured by using reflectors as they intensify the light on the floor. The reflector should be 16 in. in diameter and cone shaped, with the cone 4 in. high at the center. For best distribution of light when reflectors are used, the lights should be suspended 6 ft. from the floor, 10 ft. apart, and half way from the front of the dropping board to the front of the house.

It is stated that the available data, while quite limited, indicate that on farm lighting plants the cost of operation is about 5 cts. per bird for the winter period.

Properties of refrigerants, H. D. Edwards (*Amer. Soc. Refrig. Engin. Circ. 2 (1926), pp. 24, figs. 20*).—A compilation of data is presented on the properties of different refrigerants, dealing especially with physical properties, effect on various lubricants, toxicity, inflammability, explosive qualities, method of testing purity, and precautions essential in handling.

RURAL ECONOMICS AND SOCIOLOGY

Agricultural problems in their international aspect (*Rome: Internatl. Inst. Agr., 1926, pp. 392*).—*Statements relating to agriculture* prepared for the use of the preparatory committee of the International Economic Conference, with an introductory article on the essential elements in the increase of agricultural production and their international aspects, are included. Statistics are given of the production, trade, consumption, and prices in different countries of wheat, rye, barley, oats, maize, rice, potatoes, tea, coffee, sugar, linseed, cottonseed, rubber, cotton, flax, hemp, wool, butter, cheese, and livestock, and material relating to certain aspects of agricultural economics, as follows:

The economic conditions of production.—This article includes (1) index numbers for the United States obtained by comparing pre-war and postwar prices of agricultural products and items of farm expenses; (2) index numbers for Switzerland of farm products for 1920–1923 (1906–1913 price equals 100) and of increased cost of seasonal labor, interest on capital, cost of buildings, improvements, implements and machinery, cattle and horses, hire of implements and machinery, working expenses, and net returns for the different pre-war and postwar periods; (3) the weighted index numbers for Germany obtained by comparing prices for 1924–25 and 1925 with 1913 for agricultural products and commodities used on the farm; (4) index numbers for England and Wales for 1920–1923 (1911–1913 equals 100) for agricultural products, forage, and ferti-

lizers; and (5) average prices among the farmers in Czechoslovakia of agricultural products and farm implements, materials, labor, etc., before and since the war.

The marketing of agricultural products and its effect on increasing costs.—A short review is given of studies made in Great Britain and the United States of the differences between pre-war and postwar prices paid producers and paid by consumers for agricultural products and products manufactured from such products. Tables are included of prices paid farmers, wholesale prices, and retail prices for dairy products, fruits and vegetables, meats, poultry, eggs, cereals, flour, and bread at different periods from 1911 to 1923 in Great Britain. For the United States comparisons are shown (1) of prices received by producers and costs of marketing grains, fruits and vegetables, livestock, and eggs at different times from 1912 to 1921; (2) of the cost of raw materials, cost of manufacturing and distribution, margin, and profit at different times of manufacturing rolled oats, canned milk, bread, and wheat cereals, and of dressing beef; and (3) of the costs of wholesale and retail distribution of different commodities at different times. A special inquiry into the milk industry of Queensland is briefly summarized. A bibliography is included.

What the farmers have accomplished by means of cooperation.—A brief review is given of the development and status of cooperative credit societies and organizations for the cooperative purchase of agricultural requisites, cooperative sale of agricultural produce, and direct trading relations between cooperative organizations of producers and consumers in various countries. A list of the more important publications of the Institute on cooperation in the different countries is included.

International agricultural credit.—Reconstruction of agricultural holdings, replenishing of livestock, etc., labor shortage, distribution of rural property as result of agrarian reforms, over-population of some States requiring more intensive cultivation and the industrialization of agriculture have brought about an increased demand for agricultural credit in nearly all countries and the need of an international banking organization. The International Committee of Agricultural Credit of the International Scientific Council recommends the issuance of a questionnaire and the convening of an international conference for further study. Such a questionnaire has been issued by the International Institute of Agriculture.

[Investigations in agricultural economics at the South Dakota Station, 1926], M. R. BENEDICT (*South Dakota Sta. Rpt. 1926, pp. 24–28*).—Results are given for the year ended June 30, 1926, for the following projects:

Farm organization in Brown County.—A preliminary report for the year 1925 shows that the costs of production of wheat varied from 74 cts. to $1.65 per bushel, oats from 18 to 31 cts. per bushel, barley from 26 to 56 cts. per bushel, corn from 51 cts. to $2.20 per bushel, butterfat from 33 to 66 cts. per pound, and pork from $6.06 to $28.33 per 100 lbs. Operators' earnings varied from $723 to $5,039 per farm, and labor and management wages from −$1,038 to +$3,298.

Taxation problems of agriculture.—Detailed analyses of net earnings and taxes paid for the years 1919 and 1924 in Brookings, Hamlin, Pennington, and Beadle Counties show that the taxes equaled 17½ per cent of the average net rent from farms in 1919 and 33⅛ per cent in 1924.

The trend toward a more effective use of the land as shown by the yield per acre of certain crops, B. O. WEITZ (*U. S. Dept. Agr. Bul. 1458 (1926), pp. 32, figs. 10*).—A study is made of the trend in yields of corn, wheat, oats, and potatoes in the United States since 1885 to ascertain what part of the

increased supply has been due to increased yields and what part to increased acreage. From 1885–1889 to 1920–1924, the harvested acreage of corn increased 89 per cent, wheat 67, oats 66, and potatoes 58 per cent, and notwithstanding that much of the new acreage, especially in the case of wheat, was on soils that produced yields below the average, the average yield of corn increased 4.3 bu. per acre, wheat 2, oats 3.9, and potatoes 30 bu. The combined acreage of the four crops increased 52 per cent, the combined production 77 per cent, and the composite yield, weighted by acreage, 17 per cent per acre. The trend in the combined acreage, total production, and composite yield per acre of the four crops were 90, 131, and 145 per cent, respectively, for the Middle Atlantic States; 120, 150, and 125 per cent for the east North Central States; and 87, 155, and 177 per cent for the northern section of the South Atlantic States.

It is stated that wheat yields in northwestern Europe have gradually risen from between 6 and 10 bu. per acre to 20 bu. per acre in France and to over 32 bu. per acre in England and Germany.

Land settlement in England and Wales (*[Gt. Brit.] Min. Agr. and Fisheries, Rpt. Proc. Small Hold. and Allot. Acts [etc.], 1919–1924, pp. 150, pls. 2*).—This report deals with the workings of the Land Settlement (Facilities) Act, 1919, from its passage and the proceedings under the Small Holdings and Allotment Act, 1908, from 1915 to March 31, 1925.

From 1915 to 1924 the total net increase in lands acquired by purchase and lease was 249,118 acres and in the number of small holders settled 17,309. The county councils now have a rent roll of statutory small holdings of approximately £1,000,000 per year. Of the 22,000 men settled on small holdings since the Armistice, 10 to 12 per cent have left for financial reasons and may be considered failures. Only in exceptional cases have men with little or no agricultural experience succeeded. Of approximately 500 disabled men given a short course in some branch of agriculture and cottage holdings, about 25 per cent are successful and about 50 per cent have already failed and left their holdings. The capital cost of the scheme has been heavy, owing to the cost of providing cottages, buildings, roads, etc., and it was estimated that by March 31, 1926, £16,000,000 capital would have been spent, of which probably one-half will have to be written off. The average interest on capital loans has been over 6 per cent, while such estates at present can not provide a net return of more than 2 or 3 per cent on capital outlay.

Notes on some successful ex-service small holders and county and county borough reports on provisions of small holdings for ex-service men are included.

Crop insurance in relation to farm credits, S. M. Thomson (*Manfrs. Rec., 90 (1926), No. 1, pp. 57–59*).—The advantages, possibilities, problems, etc., of crop insurance as a protection to sources of agricultural credit are discussed. The article is based upon the study, experiments, and experience of the Hartford Fire Insurance Co. in connection with crop insurance in its southern department.

An index number of farm taxes in New York, and its relation to various other economic factors, M. S. Kendrick (*New York Cornell Sta. Bul. 457 (1926), pp. 47, figs. 18*).—The index number of farm taxes used in this study is a simple arithmetical index based on farm taxes in 34 townships in 34 counties, the average for the period 1910–1914 being taken to equal 100.

In preparing the index number townships containing cities, incorporated villages, unincorporated villages of any size, State-owned forests, much poor or nonagricultural land, and steam or electric railroads were excluded. The taxes on public utilities following highways were deducted from the aggregate levies in the selected townships.

The accuracy of the index numbers was checked in several ways, including comparisons of indexes of school taxes in the selected townships with the cost of maintaining schools throughout the State, of computed and actual taxes in the townships for a number of years, of the index numbers computed on township and acreage basis for various years, of the soil of the selected townships with the average of the counties in which located and of the State, of the indexes and actual taxes for a period of years on farms keeping cost accounts, and of the trends and fluctuations of the index numbers for the selected townships and for all general property taxes in the State.

The general index number of farm taxes in the 34 townships increased from 55 in 1887 to 62 in 1903 (secular trend 1887–1903 +0.034), to 123 in 1916 (secular trend 1904–1916 +6.76), and to 220 in 1924 (secular trend 1916–1924 +12.38). From 1887 to 1900, 23.5 to 29.8 per cent of the general property taxes levied in the 34 townships went for county purposes, 24.4 to 31.4 for township purposes, 21.8 to 27.2 for school purposes, and 16.4 to 26.1 per cent for State purposes. From 1905 to 1924, 18.3 to 25.8 went for county purposes, 40.1 to 51.6 for township purposes, 25.3 to 34.3 for school purposes, and 0 to 9.3 per cent for State purposes.

The following table gives the index numbers of farm taxes and assessed valuations in the 34 selected townships and of wages, school teachers' salaries in New York townships, and prices:

Index numbers (1910–1914=100) of farm taxes and assessed valuations in 34 selected townships, wages, school-teachers' salaries, and prices in 1890, 1900, 1910, and 1924

	1890	1900	1910	1924
Taxes in 34 townships:				
All farms	64	59	82	220
County	85	68	93	225
Township	38	38	78	202
School	51	58	89	219
State [1]	579	425	------	530
Assessed valuations of real and personal property in 34 townships	121	101	97	132
Assessed valuations of personal property in 34 townships	483	423	128	18
Union wages in the United States	71	75	96	233
Salaries of school-teachers in New York townships	61	69	94	[2] 254
Prices:				
Wholesale	83	83	103	153
Building materials	84	84	100	180
Wholesale, nonagricultural commodities	------	------	102	162
Paid to farmers in New York	------	------	101	128
Wholesale, farm products in the United States	70	70	103	143

[1] Wide fluctuations, with gaps in years with no State tax levied.
[2] 1923.

The assessed valuation of personal property as shown above not only decreased rapidly, but the number of townships assessing personal taxes decreased from 30 or more from 1887 to 1912 to 10 in 1922–1924. The receipts in the 34 townships from other sources than general property taxes increased from less than 20 per cent of such taxes in 1911 to over 49 per cent in 1924. The index numbers (1911–1914=100) of school taxes and State aid to schools in the 34 selected townships increased from 42 and 69, respectively, in 1887 to 213 and 288, respectively, in 1924.

A comparison of tax data for the 34 selected townships and those of 21 to 27 cities grouped according to size is shown in the following table:

Comparison of tax data for the 34 selected townships and those for 21 to 27 cities

	Percentage increase	
	34 townships	21 to 27 cities
Assessed value of real and personal property, 1915–1924	25	50–102
Estimated value of real and personal property, 1915–1924	34	61–130
Aggregate general property tax, 1911–1924	126	80–236
General property tax per capita, 1911–1920	136	8–132
School tax, 1911–1924	145	131–383
School tax per capita, 1911–1920	167	22–155
Receipts from State for public schools, 1911–1924	197	401–1,176
Receipts from State for public schools per capita, 1911–1924	94	65–200
Receipts from taxes on mortgages, 1911–1924	108	75–281

Rural taxation in the Province of New Brunswick, W. C. KEIRSTEAD (*Jour. Polit. Econ., 34 (1926), No. 6, pp. 669–690*).—A description of the existing tax system of the Province. The weaknesses and inequalities of the present system are discussed and recommendations made for their correction.

Forecasting the price of wheat, C. C. BOSLAND (*Jour. Amer. Statis. Assoc., 21 (1926), No. 154, pp. 149–161, figs. 3*).—World production plus carry-over was found to be the most significant factor affecting the price of wheat. A formula based on conditions prevailing from 1897 to 1914 is presented for estimating wheat prices. Using this formula the standard error of estimate for the period was 11.4 per cent, being 6.3 per cent for the 5 postwar years and 12.5 per cent for the pre-war years.

Year-to-year and seasonal fluctuations in hog prices, R. M. GREEN and H. HOWE (*Kansas Sta. Circ. 132 (1926), pp. 14, figs. 6*).—A study of the fluctuations of the average monthly receipts and average monthly prices of hogs during the period 1901–1923. Between June, 1862, and the summer of 1924, the price cycle for hogs was repeated no less than 11 times, the length of the cycle varying from about 3 to about 9½ years and averaging 67 months, of which the average upward movement lasted 36 months and the average downward movement 31 months. The normal yearly trend of average monthly receipts from 1900 to 1925 at four markets divides itself into two periods, with a maximum high point in December and January and a secondary high point in May and June, with an extreme low point in September and a secondary low point in April. The average monthly prices show a distinct upward tendency from June to the maximum in August or September, a sharp decline to the minimum in December, a rise to March or April, followed by a frequent downward tendency to June. In years of big corn crops and lower corn prices there is a distinct tendency for receipts to slow up from August to January and to increase from February to August following, as compared with years of small corn crops. In the 23 years, 1901 to 1923, the monthly receipts moved contrary to the average trend 41 times and the Chicago prices 85 times.

United States standard tobacco sizes, F. B. WILKINSON (*U. S. Dept. Agr., Misc. Circ. 83 (1926), pp. II+24, figs. 12*).—A simple system for sizing tobacco is outlined. The system was devised for use under the United States Warehouse Act, but is not mandatory.

Washington agriculture, Parts 4, 5 (*Wash. State Col. Ext. Bul. 134 (1926), pts. 4 pp. 35, figs. 33; 5, pp. 6*).—These bulletins continue the series previously noted (E. S. R., 55, p. 585) and give the data on cereal crops submitted to and the recommendations and resolutions passed by the Economic Conference held

at Spokane on June 14 and 15, 1926. Part 4 of this bulletin, by E. G. Schafer and L. Hegnauer, deals with cereal crops, and part 5 with recommendations and resolutions.

Some economic phases of the fruit industry in Rhode Island, B. B. Corbett (*Rhode Island Sta. Bul. 207 (1927), pp. 72, figs. 6*).—This study, which is part of a general study of the New England apple industry, was undertaken to obtain data as to the varieties and ages of trees, relative importance of commercial varieties and of orchards of different sizes, the probable future production of important varieties, whether the varieties now grown are best suited to market needs, the practices in grading and packing preferred by the trade, and the consumers' knowledge of fruit and his preferences. Information was secured by personal visits in 1925 to 133 farms having orchards of 100 or more bearing trees, from retailers in Providence, and from 251 questionnaires returned by consumers in Providence. Tables are given and analyzed showing (1) the size of orchards, the number of trees by variety and age, rate of total planting, probable future production, and grades of apples grown; (2) the varieties, grades, and sizes preferred and handled by retailers, type of container preferred and quantity of apples purchased by retailers, and the sources of supply; and (3) for consumers, the sources of supply, purposes for which apples were used, varieties that could be identified, varieties of apples and peaches preferred for eating raw and for cooking, factors influencing purchases, use and consumption of apples, and storage facilities. The argument pro and con for planting McIntosh, Delicious, and Rhode Island Greening is given.

The survey shows that the production of apples in Rhode Island by 1940 can be expected to increase 22 per cent, that the production of McIntosh apples may increase 135 per cent, the Delicious apples 490, the Gravenstein 68, and the Baldwin 6.5 per cent, while the production of Wealthy apples may be expected to decrease 9 per cent and that of Rhode Island Greenings 30 per cent.

Some data are included in regard to retailers' preferences and the quantities of single purchases and sales of peaches.

The market outlet for Massachusetts apples, L. P. Jefferson (*Massachusetts Sta. Bul. 231 (1927), pp. 40, figs. 7*).—This study, which is part of a general cooperative study of the economic aspects of the New England apple industry, was undertaken to discover (1) the present market for New England apples, and (2) the sections where consumption could be easily increased. It is based on personal interviews with wholesalers, both exporters and domestic, and retailers, and from questionnaires sent to consumers. Tables are given showing by years the production from 1916 to 1925 of the commercial apple crops of New England, Massachusetts, New York, and Washington; the carload shipments in 1925 from different sections to 17 selected markets throughout the United States; monthly carload arrivals on the Boston market from 1920–21 to 1924–25 from the principal sources; carload arrivals in Boston from 1921 to 1925 of apples and the chief competing fruits; sources of supplies of Massachusetts retailers; types of container handled by Massachusetts retailers; grades and sizes preferred by different types of retail trade; and the production, exports, and imports of different foreign countries. A study was made of the yearly and seasonal fluctuations in prices of apples and in the prices of the Baldwin and McIntosh varieties, variety preferences, quantities, sizes, and grades preferred by customers.

Information is given as to tariffs, transportation, packing, costs, market preferences, etc., for exported apples.

The California poultry industry: A statistical study, E. C. Voorhies (*California Sta. Bul. 413 (1926), pp. 172, figs. 58*).—Tables and charts are given and analyzed for California and the United States covering the size, distribution,

and development of the poultry industry; the production, consumption, cold-storage holdings, prices and purchasing power, exports and imports, etc., of poultry and eggs; the egg-feed price ratio; the price relationships between grades of eggs; commercial hatcheries in California; egg shipments from California; and other items. Poultry statistics are included for Canada, Mexico, China, Japan, Australia, New Zealand, and South American, European, and African countries.

Results of a study by M. W. Buster and L. W. Fluharty of the cost of producing eggs on 38 poultry farms in Sonoma County during the year ended October 31, 1925, are included.

Co-operation in the United States (*Toledo: Grain Dealers Natl. Assoc., 1925, pp. 126*).—The history, advantages and disadvantages of, and the legislation regarding cooperative organizations, especially cooperative marketing organizations, are set forth. A large part of the information is quoted from Federal and State bulletins and publications, studies and work on cooperation, and reports, etc., of cooperative organizations.

The sociology of rural life, H. B. HAWTHORN (*New York and London: Century Co., 1926, pp. [XI]+517, figs. 48*).—Socialization is held to be a fundamental problem of rural society, and the rural socialization process is considered the dynamic field of sociological study in the rural community. The interpretation, meaning, and philosophy of socialization are discussed. The social contact—the exposure or contact of a person for one hour to an event or situation having definite socializing value—is used as the standard for measuring the efficiency and economy of socialization in different communities and with different types of organization. The physiological, psychological, geographical, economic, sociological, and other factors in socialization are analyzed and the method and systems of community organization discussed.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Elements of statistics, A. L. BOWLEY (*London: P. S. King & Son; New York: Charles Scribner's Sons, 1926, 5. ed., pp. XI+463, pls. 12, figs. 25*).—The fifth edition of a work previously noted (E. S. R., 45, p. 299).

Foods and cookery, M. L. MATTHEWS (*Boston: Little, Brown & Co., 1926, rev. ed., pp. XII+297, figs. 86*).—This is a revision of a textbook previously noted (E. S. R., 45, p. 697).

The house and its care, M. L. MATTHEWS (*Boston: Little, Brown & Co., 1926, pp. XI+413, pl. 1, figs. 126*).—A textbook for senior high schools and junior colleges, including material on house planning, decoration, and furnishing, and the management of the home.

Elementary home economics, M. L. MATTHEWS (*Boston: Little, Brown & Co., 1926, rev. ed., pp. XIV+472, pl. 1, figs. 167*).—The two preceding books bound together.

A girl's problems in home economics, M. B. TRILLING and F. WILLIAMS (*Philadelphia and London: J. B. Lippincott Co., 1926, pp. [3]+314, figs. [163]*).—A textbook for use in junior high schools or beginning high-school grades. The subject matter selected is based upon the particular interests of girls in junior high schools and lower high-school grades, and covers healthful clothing, dress design, clothing construction, interior decoration, household textiles, and the care of the home.

The home project: Its use in home-making education, G. FISHER (*Fed. Bd. Vocat. Ed. Bul. 71, rev. ed. (1926), pp. VII+95*).—A revision of a bulletin previously noted (E. S. R., 46, p. 296).

Boys and girls, 4-H club work under the Smith-Lever Act, 1914–1924, G. E. FARRELL (*U. S. Dept. Agr., Misc. Circ. 85 (1926), pp. II+55, figs. 17*).—The early history of the club movement and the growth of the movement and of demonstrations from 1914 to 1924 are described and statistics given on enrollment, projects, demonstrations, results, etc. In 1924, 510,355 different boys and girls were enrolled in 38,120 clubs, and 283,283 completed the work. Since the passage of the Smith-Lever Act, 5,000,000 boys and girls have received definite instruction and practice in 4-H clubs.

FOODS—HUMAN NUTRITION

What is what in groceries, A. TODOROFF (*Chicago: Grocery Trade Pub. House, 1926, pp. 208, pls. 16, figs. 15*).—By means of questions and answers useful information is given on a wide variety of food products entering into the grocery trade, including their production and preparation for market, definitions and trade names, and standard grades and sizes of canned goods.

The household preservation of eggs, F. T. SHUTT (*Canada Expt. Farms Circ. 31 (1926), pp. 2*).—While admitting that "nothing has been discovered that will serve to retain without a suspicion of taint the fine flavor of the strictly newlaid egg," the author is of the opinion that limewater is a reliable home preservative of eggs and is superior in some respects to water glass. The limewater should be prepared by slaking freshly burned quicklime, thinning with water to the consistency of cream, and further diluting, with constant stirring, to the desired volume (1 lb. of quicklime to 5 gal. of water). The solution may be used without settling, or allowed to stand for an hour or more and the clear liquid decanted from the excess lime. The eggs in any suitable clean receptacle should be covered with limewater and stored in a cool place. Salt should not be added to the limewater.

Salads all the year, D. A. LOUDON (*N. Dak. Agr. Col. Ext. Circ. 72 (1926), pp. 30*).—This circular contains a serviceable collection of recipes for salad dressings and salads, the latter being selected with particular reference to securing combinations high in vitamin content and utilizing foods, particularly vegetables, common to North Dakota.

Studies of basal metabolism in New Orleans, R. HAFKESBRING and P. BORGSTROM (*Amer. Jour. Physiol., 79 (1926), No. 1, pp. 221–228, fig. 1*).—In this and the following three papers are reported various phases of a general study of metabolism in New Orleans as representative of semitropical climate. A series of 89 basal metabolism determinations was made on 9 subjects (7 men and 2 women) at approximately 1½-hour intervals from 13.5 to 19 or 20 hours after the preceding meals, which varied in kind and quantity.

The results, calculated in calories per square meter of body surface (Du Bois formula), showed in nearly every case a definite drop to a minimum, followed by a rather sharp rise to values in some cases above the values first obtained. The minimum values tended to be approximately the same for each subject, but the time at which they occurred was dependent upon the kind and quantity of the food eaten. The minimum values for all of the subjects were lower than the Du Bois, Harris-Benedict, and Dreyer standards, the average deviations from these standards being −18, −16, and −14 per cent, respectively.

These results are considered of significance in suggesting a lowered basal metabolism in semitropical climates. "It has been shown that the protein intake in New Orleans is approximately 60 per cent of that of the northern standards, and whether this is one of the factors for a lowered metabolism remains to be studied. The whole subject of metabolism in tropical and semi-

tropical climates is one that is much in need of investigation, and the validity of applying standards which have been determined in temperate climates is open to question."

Study of the protein intake as indicated by urinary nitrogen, P. Borgstrom and R. W. Bost (*Amer. Jour. Physiol.*, *79* (*1926*), *No. 1*, *pp. 229–236*, *figs. 2*).—Two of the male subjects of the preceding study served as subjects in the present study in which daily determinations of urinary nitrogen were made for a year. During this period one of the subjects was in North Carolina during June, July, and August and the rest of the time in New Orleans. The other subject was in New Orleans the entire time.

The range in daily urinary excretion was from 8.8 to 13.59 gm. per kilogram of body weight for the first subject and from 8.33 to 11.44 gm. for the second. Some daily variations were shown which were thought to be due to variations in the amount of exercise. There was also some seasonal variation in the second subject while living at home but questionable variation when eating at the boarding house. Climatic conditions are thought to be the probable cause for the lowered protein intake.

Dietary studies in New Orleans in 1925, P. Borgstrom, R. W. Bost, and R. Hafkesbring (*Amer. Jour. Physiol.*, *79* (*1926*), *No. 1*, *pp. 237–241*).—In this attempt to determine the number of calories eaten by a normal individual in a warm climate, three of the subjects of the foregoing studies lived for several days on weighed diets of apples, bananas, bread, butter, cheese, eggs, milk, oatmeal, potatoes, sugar, and ripe tomatoes. The amounts eaten by each were such as to satisfy the appetite, adjustment being made where necessary. It is noted, however, that at the end of the experiment the subjects felt that they had been eating more than a normal amount. The diets were calculated daily for fat, carbohydrate, protein, and calories and the amounts averaged after five days. Two five-day periods in August and September were reported for two of the subjects and one for the third. Urinary nitrogen determinations were included.

In the September period the total calories per 70 kg. of body weight for the three subjects were 3,410, 2,580, and 4,050, respectively. The distribution of calories was fat 40.8, 28.1, and 32.6 per cent and protein 12.4, 11.6, and 12 per cent, respectively. In all cases the urinary nitrogen was higher than accepted normal values. Assuming that this represented a food intake above normal, a recalculation of the energy values was made. The corrected or assumed normal values were 2,530, 2,380, and 2,730 calories, respectively. The basal metabolism figures for the three subjects were 1,325, 1,400, and 1,395 calories, respectively. It is pointed out that the average of the normal calculated values was about twice the average of the basal requirement.

The data are thought to indicate that the calorific intake in the south does not vary much from that of the north, but that the protein intake is lower.

Effect of increased diet on basal metabolism in New Orleans, P. Borgstrom, R. Hafkesbring, and R. W. Bost (*Amer. Jour. Physiol.*, *79* (*1926*), *No. 1*, *pp. 245–253*, *figs. 2*).—Basal metabolism experiments were conducted on five subjects, four men and one woman, of the preceding metabolism study of Hafkesbring and Borgstrom and on one additional woman subject at about the same time after meals varing widely in caloric value as determined for the most part by fluctuating urinary nitrogen.

With increased food intake there was a large fluctuation in basal metabolism, the first change occuring being a marked decrease in oxygen consumption, with fairly constant values of carbon dioxide. When the increased food intake was maintained at a fairly constant level the values of oxygen consumption

gradually returned to normal, but with another change in diet the same phenomenon occurred.

Several possible causes for these fluctuations are discussed, and the question is raised as to whether the phenomenon is general or is characteristic of warmer climates with lowered basal metabolism.

The straight and narrow path to normal weight, H. H. MITCHELL (*Sci. Amer., 136 (1927), No. 2, pp. 110, 111, fig. 1*).—A popular discussion of the most advisable methods of reducing weight by diet restrictions.

Growth and reproduction on synthetic diets, Part I, G. A. HARTWELL (*Biochem. Jour., 20 (1926), No. 6, pp. 1273–1278, fig. 1*).—In an effort to obtain more satisfactory synthetic diets for nutrition experiments with rats, six diets composed of practically the same constitutents in various combinations and all prepared by the cooked method (E. S. R., 55, p. 411) were tested on young rats, starting at 23 days of age and continuing for over a year.

Good but not maximal growth was obtained with all of the diets. One gave almost as good growth as a mixed diet but was inadequate for reproduction, while another gave less satisfactory growth but good reproduction. The diet giving a growth curve corresponding most closely to the mixed food curve consisted of caseinogen (purified from vitamins A and B) 20 gm., pure potato starch 64 gm., cod-liver oil 4 and cottonseed oil 10 cc. (both of which were replaced after 4 weeks by butter 12 gm.), Hartwell's salt mixture 4 gm., marmite 5 gm., and water 300 cc.

Growth in children with diabetes mellitus, W. S. LADD (*Amer. Jour. Diseases Children, 32 (1926), No. 6, pp. 812–838, figs. 13*).—The histories of 34 cases of diabetes mellitus and 1 case of possible renal diabetes in children varying in age from less than a year to 20 years are discussed with reference to well-known standards of growth and food intake.

At the onset of the disease all but 4 of the patients were either overweight or overheight for age or both. During the progress of the disease, except under insulin treatment, growth in height diminished or ceased entirely. The impulse for growth in height persisted longer and was slower in starting again than the impulse for changes in weight. Under insulin treatment growth followed. The optimum weight for the diabetic child is considered to be the average weight for height as expressed in the Bardeen growth curve of normal children, and the optimum food intake to be about two-thirds of the total calories of the Holt and Fales standards (E. S. R., 48, p. 654). The average proportions of carbohydrate, protein, and fat in the diets employed were 35, 15, and 50 per cent, respectively, of the total calories. It is pointed out, however, that this is not necessarily the best proportion, and that in some cases proportions nearer the normal according to the Holt and Fales standards may yield excellent results.

A comparison of the effects of supplementary feeding of fruits and milk on the growth of children, A. F. MORGAN, G. D. HATFIELD, and M. A. TANNER (*Amer. Jour. Diseases Children, 32 (1926), No. 6, pp. 839–849*).—In this comparison of the value of milk, orange, and figs as supplementary lunches, 47 children from the California State School for the Deaf and Blind were divided into two groups of 13 each, one of 10, and a control group of 11. All received the usual diet, supplemented in one group by ½ pint of milk, another by 1 medium orange, and another by 4 pulled figs. During the 18 weeks of the experiment the children were repeatedly examined by the Baldwin-Wood, Pirquet, and Dreyer methods.

At the end of 14 weeks the milk, orange, and fig groups had shown almost the same amount of improvement, and the control group only about one-fourth

as much as judged by the Baldwin-Wood standard. As judged by the Pirquet sitting height-body weight standard, the orange group showed the greatest gain, followed by the fig and control groups with about one-half as much, while the milk group had fallen off a little. By the Dreyer chest circumference-sitting height standard the orange group led, followed by the control and milk groups, with the fig group least. The average gains by all three standards were highest for the orange group, followed in decreasing order by the fig, milk, and control groups. The gross average gain in weight was largest for the milk group, and the average percentage gain in weight above the expected gain according to the Holt standards was highest for the orange and milk groups.

At the end of this period 7 of the children were changed from the milk to the orange lunch and 7 from the orange to the milk and the feeding continued for 4 weeks longer. During this time the rate of gain in weight was decreased in those changed from orange to milk but very little affected in the other group. "The percentage of the original groups showing increases after 14 weeks in standing and sitting heights was greatest in the milk group, in chest circumference, chest expansion, and vital capacity in the fig group, and in hand-grip strength in the orange group. Of these six measurements, real differences in proportion of increase are thought to be shown only in sitting height in which the milk group excelled, and in chest circumference, chest expansion, and vital capacity in all of which the fig group excelled. The average of all measurements showed the number of increases in the fig group to be the largest."

The effect of fat on the tryptic digestion of protein in vitro, M. Maughan (*Biochem. Jour., 20 (1926), No. 5, pp. 1046–1051, figs. 3*).—In this study a solution of egg albumin, pH 1.7, previously digested with pepsin for 24 hours at 37° C. was subjected to trypsin digestion in M/10 buffer solution of sodium phosphates, starting at pH 8, in the presence of a gum acacia emulsion of olive oil. A control experiment was run with the oil omitted, and the rate of trypsin digestion in both was determined by the Sørensen formol titration method. In the adjustment of the H-ion concentration, two methods were used, in the first of which the control mixture was brought to pH 8 by the addition of the sodium hydroxide solution and an equal volume of sodium hydroxide solution was added to the emulsion mixture. In the second both the control mixture and the emulsion mixture were brought to pH 8.

In the first method the variations which occurred were almost all within the limits of experimental error, although a slight accelerating effect of the fat emulsion was evident in every case. This acceleration increased as digestion proceeded but never exceeded 10 per cent. In the other method no definite effect of the olive oil was observed, but a higher pH was recorded in the concentrations of oil in which variations in pH could be detected.

Various factors are suggested as affecting the rate of digestion of such mixtures. "At the present stage it is impossible to say how far each of these factors is concerned, but the gross results of the foregoing experiments show that olive oil, unhydrolyzed and in the form of an emulsion, does not retard the action of trypsin in vitro on albumin previously digested with pepsin. The explanation of the retarding action of fat on the digestion of protein in vivo may be found either in the action of the products of the hydrolysis of fat or in some specific action of fat in the alimentary canal."

The physiological rôle of vitamin B, I, II (*Biochem. Jour., 20 (1926), No. 6, pp. 1229–1263, figs. 13*).—Two papers are presented.

I. ***The relation of vitamin B to tissue oxidations*, J. C. Drummond and G. F. Marrian** (pp. 1229–1255).—The extensive and conflicting literature on the possible relationship of vitamin B to the oxidative activity of animal tissues and

on the general problem of the physiological rôle of vitamin B has been reviewed critically, with a repetition of much of the experimental work under carefully controlled conditions.

Evidence is first presented that absence of vitamin B brings about no reduction in the oxidative activity of excised muscle and liver tissue of rats and pigeons, as determined either by the rate of reduction of methylene blue or direct measurement of the oxygen consumption. Determinations of the oxygen consumption of rats during progressive vitamin B deprivation indicated that the consumption remains at a normal level until the final phase of the disturbance, which is characterized by a sharp fall of body weight, rectal temperature, and oxygen consumption. Parallel experiments conducted on rats receiving from 0.5 to 1 gm. of yeast extract as their sole food gave identical results, from which the conclusion is drawn that the fall of body temperature and oxygen consumption are the result of an exhaustion of reserve food materials and not of failure of the oxidative mechanism of the tissue. Further evidence of the similarity of the symptoms of extreme vitamin B deprivation and simple inanition was furnished by the fact that in both cases temporary recovery followed an artificial increase in body temperature brought about by warming the animal. Moreover, the concentration of reducing substances in the blood of rats suffering from inanition and vitamin B deficiency followed the same course—hyperglycemia (associated with hypertrophy of the adrenal glands), followed by a sharp fall to values below the normal level at the time of decreased body temperature and oxygen consumption.

In the authors' opinion the explanation of the physiological effects of vitamin B is to be sought in the relation of vitamin B to appetite as pointed out by Osborne and Mendel (E. S. R., 38, p. 568) and confirmed by Karr (E. S. R., 44, p. 860) and by Cowgill and his coworkers (E. S. R., 54, p. 194), and the resulting quantitative relationship between the amount of vitamin B and the total food intake.

II. *Relation between vitamin B and protein in the diet of growing rats*, V. Reader and J. C. Drummond (pp. 1256–1263).—In the experimental work reported in this paper, young rats of approximately 50 gm. weight were fed in one series diets the composition of which was so adjusted as to give similar ratios between the amount of protein and yeast (as a source of vitamin B) but of different caloric value, and in another series diets composed of the same materials so adjusted as to give the same proportion of protein, with varying amounts of vitamin B. The object of these variations was to determine whether there is a quantitative relationship between vitamin B and total calories or between vitamin B and protein as shown by growth records.

The growth curves and food consumption records over a period of several weeks showed in the first series no correlation between the total calories or carbohydrate content of the diet and the vitamin B. In the second series, with the protein fixed at 70 per cent of caseinogen and the vitamin B varying from 4 to 20 per cent of yeast extract, a normal rate of growth was attained only with at least 16 per cent of yeast extract. Varying fat content was without effect.

In all the groups the ratio between the weight of thyroid and total body weight was within the normal limits given by Donaldson. On the low vitamin B-high protein diets the kidneys were hypertrophied, but there was no destruction of kidney tissue.

The quantitative relation between protein and vitamin B thus demonstrated confirms the views of Hartwell (E. S. R., 55, p. 694), and appears to offer an explanation of the inadequacy for growth of the high protein diets previously

Gaseous metabolism in the final state of B avitaminosis in birds [trans. title], B. A. LAWROW and S. N. MATZKO (*Biochem. Ztschr., 179 (1926), No. 4-6, pp. 332-347, figs. 3*).—This paper also summarizes the conflicting literature on the effect of lack of vitamin B on the oxidation processes in the body, and reports a series of gaseous metabolism experiments conducted on two fowls before and during polyneuritis. The data reported indicate no alteration in the oxygen consumption per kilogram of body weight with the onset of polyneuritis, but a slight increase in carbon dioxide production resulting in a higher respiration coefficient.

The authors reached the same conclusion as Drummond and Marrian that the final lowering of gaseous metabolism in polyneuritis is the result not of a lowering of the oxidative power of the organism but of starvation.

Yeast extract as a supplement to gelatin, G. A. HARTWELL (*Biochem. Jour., 20 (1926), No. 6, pp. 1279-1281, fig. 1*).—Growth experiments with rats are reported which indicate that yeast extract, marmite, has a supplementing effect for gelatin unrelated to its content of vitamin B.

Vitamin content of canned spinach, E. PIERSON (*South Dakota Sta. Rpt. 1926, p. 23*).—Ten gm. of spinach canned by blanching for 15 minutes in steam and processing for 90 minutes in the pressure cooker at 15 lbs. pressure failed to delay the onset of scurvy or prolong the lives of guinea pigs on the basal scorbutic ration of Sherman, La Mer, and Campbell. Animals receiving the same amount of spinach steamed for 15 minutes developed scurvy at an early date, but lived somewhat longer than those receiving the pressure-cooked spinach. This is thought to indicate that the greater part of the vitamin C in the spinach is destroyed in the blanching process.

The vitamin C of lemon rind, S. G. WILLIMOTT and F. WOKES (*Biochem. Jour., 20 (1926), No. 5, pp. 1013-1015*).—In continuation of the studies on citrus fruits (E. S. R., 55, p. 593), data are given on the vitamin C content of lemon rind as determined on guinea pigs by the preventive method.

The extract prepared as described in the previous study, but concentrated to such an extent that 1 cc. represented 1 gm. of the rind, was fed to three groups of 4 guinea pigs each in amounts of 0.5, 0.75, and 1 cc. daily as supplement to a basal diet of bran and oats, 2:1, supplemented by 50 cc. daily of fresh milk autoclaved at 15 lbs. pressure for one hour. None of these amounts furnished sufficient vitamin C to prevent the development of scurvy.

It is concluded that the protective dose of fresh lemon flavedo must be much larger than that reported for fresh orange peel by Hess and Unger (E. S. R., 39, p. 771).

A reliable specific ration for experimental scurvy [trans. title], N. BEZSSONOFF (*Compt. Rend. Acad. Sci. [Paris], 183 (1926), No. 20, pp. 921-923*).—In the opinion of the author the inclusion of autoclaved milk in a basal scorbutic ration, as proposed by Chick and Hume and used by many workers, is open to criticism on account of the variable but appreciable amounts of vitamin C which may be present in the milk. In his experience 22 per cent of the guinea pigs placed on this ration survived to the fortieth and 7 per cent to the fiftieth day. As a substitute for the milk fresh egg yolk is suggested. On a basal diet composed of 900 gm. of oats mixed by hand with 100 gm. of bran, 40 gm. of fresh yeast, and 75 gm. of egg yolk emulsified with 125 cc. of water, guinea pigs are said to succumb without exception before the thirty-third day. Using this ration, the minimum antiscorbutic dose of fresh lemon juice for a 400-gm. guinea pig was found to be 3 cc., as compared with 1.5 cc. reported by Chick and Rhodes and by Davey (E. S. R., 45, p. 869) with the use of the other ration.

Distribution of endemic goiter in the United States as shown by thyroid surveys, R. OLESEN (*Pub. Health Rpts.* [*U. S.*], *41* (*1926*), *No. 48, pp. 2691–2703*).—This summary of the distribution of endemic goiter in the United States, as shown by thyroid surveys in 40 States, indicates foci of endemic goiter in localities not previously regarded as being located in goitrous territory. In the opinion of the author, however, the incidence of goiter is not so universal as to require wholesale prophylaxis in all States.

TEXTILES AND CLOTHING

Textiles and the new generation, E. W. CAMP ET AL. (*Lubbock, Tex.: Tex. Technol. Col., 1927, pp. 47, figs. 48*).—This pamphlet is descriptive of the textile activities, aims, and equipment of the Texas Technological College and points out opportunities in the textile field.

South American wools, H. KENNINGHAM (*Jour. Textile Inst.*, *18* (*1927*), *No. 2, pp. T81–T98, pls. 4, figs. 8*).—The status of wool production in the South American countries is summarized, and typical wools are described and illustrated.

Effect of alkalies on wool.—II, Experiments comparing effects of sodium compounds, potassium compounds, and temperature, H. C. CHAPIN (*Amer. Dyestuffs Rptr.*, *16* (*1927*), *No. 2, pp. 90–94*).—In further studies (E. S. R., 54, p. 596) at the Lowell Textile School the strength of wool was measured before and after treatment with water, alkali carbonate solutions, and soap solutions at about 50° C. (122° F.).

Conclusions applicable only to action within the bath were that the effects of small changes in treatment were so apparent as to justify use of weakening effect as a measure of surface harshening effect, provided only that some direct connection exists between the two. In solutions of equal molecular concentration sodium carbonate and potassium carbonate had equal weakening effect. Sodium soap was small in effect compared with that of the hot water in which it is dissolved and much smaller than that of 0.1 N sodium carbonate or potassium carbonate solution. A soap which weakens wool in water alone may in solution with alkali carbonate reduce the weakening effect of the carbonate. A rise of 1° in scouring temperature had about the same weakening effect on wool as an increase of 25 per cent in carbonate concentration when the temperature is near 50° and carbonate concentration near 0.2 N. For control of scouring bath alkalinity with delicacy equivalent to that of observation of effects on wool pH should be carefully measured to within a few hundredths of a unit, although rougher measurements might serve to indicate wide departure from desired conditions.

The structure and development of the cell wall in plants.—I, Bast fibers of Boehmeria and Linum, V. C. ALDABA (*Amer. Jour. Bot.*, *14* (*1927*), *No. 1, pp. 16–24, pls. 3*).—According to studies reported on from the Bussey Institution of Harvard University, the bast fibers of *B. nivea* may attain a length of more than 550 mm. The processes of cell enlargement and of cell wall differentiation occur simultaneously in the bast fibers of *B. nivea* and *L. usitatissimum*. The elongating apical portion of an actively growing fiber is invested solely by a tenuous, hyaline membrane which is in direct continuity with the outermost lamella of the thick wall jacketing the basal portion of the fiber. The development of the cell wall and fiber is outlined.

The distribution of nitrogen in the flax plant and its elimination from flax in the processes of manufacture, J. W. PORTER (*Jour. Soc. Chem. Indus.*, *45* (*1926*), *No. 39, pp. 335T–337T*).—The nitrogen content of flax seed ranged

from 2.5 to 3 per cent in the samples examined. The chaff contained 0.538 per cent, which would add to the value of the seed for feeding. There was a gradual increase in the nitrogen content of the stem from the root up, i. e., root ends 0.256, middles 0.342, and tops 0.455 per cent, with a mean of 0.348 per cent. The branched portion of the stem had a rather high nitrogen content, 0.832 per cent. The bulk of the nitrogen appeared to be associated with the cortex, and the nitrogen in the other portions of the flax plant seems due to adhering cortex.

Tracing Irish flax straw through various stages of manufacture from retting to bleaching gave considerable information on changes occurring, especially in the bleaching process. The difficulty of bleaching linen lies in the resistant nature of the cortex. Its potassium and phosphorus contents give the cortex a certain value for fertilizer.

Chemistry of pulping flax straw, M. W. Bray and C. E. Peterson (*Indus. and Engin. Chem., 19 (1927), No. 3, pp. 371, 372, fig. 1*).—The action of sodium sulfite solution upon flax straw grown for seed purposes at two concentrations of chemical and at two ratios of chemical to oven-dry material under cooking conditions otherwise constant has been studied at the U. S. Forest Products Laboratory at Madison, Wis. A change of concentration of the sodium sulfite solution from 40 to 80 gm. per liter seemed to have little effect on time of cooking or upon the relation of chemical properties of the fibrous residue to yield, whereas a change in the ratio of chemical to straw from 20 to 40 per cent by weight greatly accelerated the rate of cooking. The progress and results of the reaction are outlined.

The specific volume of cotton cellulose, G. F. Davidson (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 6 (1927), No. 3, pp. 41–52, figs. 2*).—The specific volumes at 20° C., as determined in helium, were for American upland 85R soda boiled 0.638 and mercerized 0.645, Sea Island 0.642 and 0.647, and Sakel 0.64 and 0.645, respectively, viscose rayon 0.646, cuprammonium rayon 0.653, and nitro rayon 0.648. In every case the helium value was about 1 per cent lower and the water value from 3 to 5 per cent lower than the toluene value. The methods are outlined briefly.

MISCELLANEOUS

Research and experiment-station activities [of the New York State College of Agriculture at Cornell University, 1926, R. W. Thatcher] (*N. Y. Agr. Col. (Cornell) Ann. Rpt., 39 (1926), pp. 15–31, 69*).—An account of the research activities of the year, including the operations of the Cornell Experiment Station and its receipts and expenditures from the Federal funds, is presented for the fiscal year ended June 30, 1926.

Annual Report of [South Dakota Station], 1926, J. W. Wilson et al. (*South Dakota Sta. Rpt. 1926, pp. 39*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1926, and department reports on the work of the station during the year. The experimental work reported is for the most part abstracted elsewhere in this issue.

Abstracts of Bulletins 328–346 and Circulars 32–42, A. D. Jackson (*Texas Sta. Circ. 44 (1927), pp. 18*).—The publications abstracted have been previously noted.

Publications for free distribution to farmers (*Vermont Sta. Circ. 12 (1924), pp. 2*).—The available bulletins serviceable to farmers are listed.

NOTES

California University and Station.—The budget of the university for the ensuing biennium, as just passed by the legislature, carries an appropriation of $300,000 for the construction and equipment of an animal science building for the branch of the College of Agriculture at Davis.

According to a note in *Science*, Dean and Director E. D. Merrill has been appointed director of the California Botanic Garden at Los Angeles, beginning June 1, on a partial leave of absence from the university. This enterprise is under the direction of the Garden Foundation, Incorporated, a nonprofit, nonstock corporation organized for scientific, educational, and charitable purposes. A tract of about 3,200 acres of land located in and around Mandeville Canyon is available, of which about 2,400 acres will be sold for residential purposes and the profits accruing utilized as the endowment fund of the institution and in the development of the remaining 800 acres as a botanical garden.

Georgia Station.—A manufacturer of peanut products has become interested in the breeding of a better type of peanut, and is contributing the salary and operating expenses of one member of the station staff to devote his entire time to research in peanut breeding.

Purdue University and Station.—During the next two years the station will receive in addition to its general maintenance funds a State appropriation of $70,000 for a research unit of the agricultural engineering building and $25,000 for an addition to the poultry building. In an act for combating the European corn borer $75,000 was included for the station for research and demonstration work with the borer and the codling moth. George A. Ficht, who for two seasons has been in charge of the Dominion Corn Borer Laboratory in Ontario, has been appointed assistant entomologist for research on the borer, while Loren F. Steiner has been appointed assistant entomologist to carry on codling moth studies in an extensive way in southern Indiana orchards.

A corn borer exhibit train was operated in northern Indiana by the university in cooperation with the U. S. Department of Agriculture and the Pennsylvania Railroad from March 28 to April 8. Two cars were used, one for exhibits and one for lectures and moving pictures. At 26 stops, 6,614 people visited the train, which formed a part of the educational campaign which is being waged by the university and the Department to acquaint farmers with the seriousness of the corn borer situation.

A farm electric car equipped with electrical appliances suitable for farm and home use and operated by the university in cooperation with the principal traction companies of the State recently completed a tour of 48 counties over electric lines, covering a distances of 2,526 miles. The car was on the road 51 days, made 182 stops, and was visited by 27,034 people.

Laurenz Greene, head of the department of horticulture, has been granted sabbatical leave for one year to be spent at the University of California and in a study of the fruit and vegetable marketing problems of the Pacific coast.

Iowa College and Station.—Four new buildings are soon to be erected for the use of the college and station from a State appropriation just granted by the legislature. A new dairy manufacturing building will be erected and equipped at a cost of $500,000, and $150,000 will be used for erecting a new

feed storage barn, a horticultural crop storage building, and a storage building for the agronomy section.

Dr. H. E. Bemis, head of the college veterinary surgery department and vice dean of the veterinary division, has resigned to become head of the veterinary surgery work at the University of Pennsylvania. Dr. Charles S. Reddy, associate pathologist in the U. S. D. A. Bureau of Plant Industry, has accepted a position as assistant professor in the division of botany and plant pathology.

Massachusetts College.—President Edward M. Lewis has accepted the presidency of the University of New Hampshire and will enter upon his new duties September 1.

Montana College and Station.—President A. Atkinson has been granted leave of absence for study during the next college year. Dean and Director F. B. Linfield has been appointed acting president in his absence. Dr. Arnold H. Johnson, assistant chemist in the station, has also been granted leave of absence for one year to accept a fellowship for study in Europe given by the International Education Board.

C. N. Arnett, head of the department of animal husbandry and vice dean of agriculture, has resigned, effective September 1, to devote himself to his livestock interests.

New York State Station.—The 1927 legislature appropriated $18,000 for special investigations on nursery stock production in New York in anticipation of the Federal quarantine on imported nursery stock to go into effect in 1930. H. B. Tukey, associate in research (horticulture) in charge of the Hudson River Valley fruit investigations of the station, has been appointed acting chief in research (horticulture) and given charge of the nursery investigations with headquarters at Geneva, part of the appropriation having been made immediately available. L. C. Anderson, county agent for Rockland County, has been appointed associate in research (horticulture) to succeed Mr. Tukey at Hudson, beginning May 1.

Frank J. Kokoski, analyst with the Massachusetts Station, has been appointed assistant in research (chemistry) to fill the vacancy caused by the resignation of R. B. Dayton, previously noted.

Under the auspices of several representatives of the electric light industry a series of investigations are to be begun this spring on the attracting of orchard pests by light. The work will involve both field and laboratory observations. An effort is to be made to get at some of the fundamental principles involved in light attraction of insects, and the cooperation of physicists from Cornell University has been secured to aid the entomologist of this station in the interpretation of their results. Lights of different intensities and colors are to be used, the observations continuing until harvest in the station orchards. The studies this season are regarded as largely preliminary, and continuation of the work will depend on the possibilities for practical results that may be obtained.

Wisconsin University.—Walter A. Duffy, who has been in the county agent service of the institution since 1920, became State commissioner of agriculture on April 1. It is thought that his appointment will insure a continuation of the close cooperation which has always been maintained between the college and the State Department of Agriculture in all movements for agricultural betterment in the State.

EXPERIMENT STATION RECORD

VOL. 56 JUNE, 1927 No. 8

Announcement is made that the forthcoming report of the Office of Experiment Stations for the fiscal year ended June 30, 1926, is to contain a discussion of the first 20 years under the Adams Act. This legislation, approved March 16, 1906, became effective on June 29 of that year, so that the fiscal year 1926 terminated investigations under its provisions extending over a score of years. Reports as to the operations thereunder have been made year by year, but there has not as yet been attempted any comprehensive summary of the period as a whole.

In many ways the passage of the Adams Act was one of the notable events in the history of agricultural research. The Hatch Act of 1887 had initiated the policy of Federal aid to agricultural experimentation through a system of stations associated with the colleges of agriculture, but this action was itself in the nature of an experiment, and the new legislation was first of all a vote of confidence in the wisdom of the undertaking after nearly 20 years of trial. Its practical effect of doubling within a few years the Federal contributions to these institutions was also an important benefit, though more vital in the case of some of the States than others.

Looking backward over the years, however, the outstanding significance of the Adams Act is seen to be its restriction to the "conducting of original researches or experiments bearing directly on the agricultural industry of the United States." As was predicted in these columns at the time of its passage, "if held strictly to the purposes specified in the act it will have a great opportunity for placing the American stations on a high level as research agencies, and give them a leadership in developing the science of agriculture. It is the greatest opportunity for continued systematic research along agricultural lines which has ever been presented in any country, and this opportunity and the realization of the ultimate importance of investigation should be the inspiration of every station man and every friend of agricultural advancement. It should be a strong incentive to the careful choice of problems to be investigated, thor-

ough and exhaustive work in their solution, and the securing of permanent and far-reaching results."

The Adams Act came into operation at a time when the stations were beginning to feel acutely the need for funds which could be devoted to the more fundamental aspects of original research. Experience had taught that while some of the simpler problems could be solved quite readily, there were many others so intricate that long-continued and intensive investigations would be essential if material progress was to be made. The act, therefore, was a response to the feeling that there should be larger opportunity for quiet, undisturbed research than was possible in any considerable degree with the resources available and the popular demand for immediately available findings. This condition was prevalent in nearly every State, since even in many where the stations were most generously supplied with State or local funds these were restricted closely to specific inquiries and often designed to meet emergency situations.

The new legislation started with an appropriation of $5,000 to each State, increasing by $2,000 a year until it reached maturity in 1911, and authorizing an appropriation of $15,000 for that year which has since been continued annually. This provision for gradual enlargement of the appropriation was a wise one, for not all of the stations were prepared at that time to use to advantage an appropriation of the ultimate amount provided. The gradual increase gave them opportunity to adjust themselves and their forces to the new provision. As it was, a shortage of competent investigators developed in some lines and proved in numerous instances a limiting factor to rapid progress. Fortunately, however, the standards set were from the first such as to attract new recruits who saw in this field a larger opportunity for a true research career, and served as an incentive and encouragement to others to prepare themselves by thorough training. The fund, therefore, has served the double purpose of establishing and maintaining definite lines of original inquiry and of stimulating more extensive development in this field throughout the stations.

One helpful factor in organizing the new work on a high plane was the constructive attitude of the Association of American Agricultural Colleges and Experiment Stations. The feeling of this body was early expressed by its committee on experiment station organization and policy, which laid down the following broad proposition: "It is evidently the intention of the Adams Act to provide the means for carrying on investigations of a relatively high order, with a view to the discovery of principles and the solution of the more difficult and fundamental problems of agriculture. To this end it is very desirable that careful attention shall be given to the

choice of definite problems to be studied and the methods by which the solution of these problems is to be sought. Investigations in connection with which there is good reason to expect the establishment of principles of broad application should be preferred to those which have only local or temporary importance, or from which only superficial results are to be obtained." In the years which followed, this view was consistently adhered to.

In the administration of the Adams Act, the distinct innovation was instituted of placing the work done under its provisions on a basis of concrete projects, for the support of which, after approval by the Office of Experiment Stations, definite allotments of funds were made by the respective stations. This was the real beginning of any general employment of the project system by the stations. It has now become an established procedure at most of these institutions for both Federal and State funds, and has added greatly to the definiteness and methodical prosecution of the station work as a whole.

At the close of the 20-year period a total of 443 projects were being supported as a whole or in part from the Adams fund. The number had become substantially stabilized, 58 projects being concluded or transferred to other funds during the fiscal year and 63 new projects inaugurated. The number of projects per station ranged from 2 to 17, but these extremes were exceptional, and in most instances the number was not far from the average of a little over 9. This means an average support from the Adams fund of about $1,625 per project, but the amount varies widely with the nature of the individual project, the number of Adams projects at a station, and the extent of its other resources. While no estimate is available of the State contributions to the Adams projects, in many cases they fully equal the Federal funds allotted.

One point on which an interesting light is now revealed is that of the relative permanence of the Adams projects. Of the 443 projects active in 1926, over half had been under way for over 5 years and over one-fourth for 10 years or more. Nearly 10 per cent had been in progress for over 15 years, and no fewer than 22 projects had been continued from the beginning of the 20-year period. This illustrates at once the intricate nature of many problems and the fact that time is a primary requisite for their solution. Such subjects as the cumulative effect of various treatments on soils, the nutritive requirements of apple trees at the different stages of their growth, the interrelation of stock and scion, or the nature and transmission of an obscure disease or physiological trouble naturally require protracted research which should not be interrupted until definite conclusions have been reached. It is fortunate that the way is open for such protracted studies when occasion arises.

Many of the older projects have been restated from time to time to conform with the progress of the investigations. Some projects inevitably develop and expand as the work goes on. One step leads to another, and it is in accordance with the nature of research that the procedure should be adapted to the new situation. The primary object in the administration of the Adams fund has been to conserve it for lines which make progress and hold promise and to keep the project statements reasonably up to date as an expression of the status of the investigation as well as of its nature and purpose. This effort has met with cordial response, which has resulted in the high type of work maintained under the act.

Such a condition, however, is not to be confused with vacillation and shifting of purpose. The point of view and the means employed may change, but purposeful inquiry adheres to its objective as long as there is adequate encouragement to do so. It will not allow itself to be diverted merely because something else has arisen which looks attractive. Nor is it a justification of an occasional tendency to prolong a project by digressing into unrelated side lines or of a disposition to allow projects to become stereotyped and to drift along without conviction that the work is advancing or even that the method is adequate. Such tendencies overemphasize the feature of continuity and fail to stress constructive effort with concentration on a definite objective. The experience of the 20 years has brought about a general realization of the need of this concentration.

As would be expected, the projects have from the beginning covered a wide range of subject matter. By far the largest group is that of plant diseases and related troubles, on which 94 of the 443 projects, or over one-fifth of the total number, are centered. The next largest are the soils and fertilizers projects, numbering 60, and the breeding and genetic studies with 54. There are 44 projects dealing with economic insects, 43 with animal diseases and pests (including poisonous plants of the western ranges), 41 on various botanical, breeding, agronomic, and other aspects of field crops, and 38 in horticulture and forestry. Fundamental studies of nutrition and animal production are represented by 36 projects, dairying has 11, agricultural engineering 4, and the remaining 18 relate to chemical studies of various kinds, the technology of cane sugar making, and miscellaneous subjects.

Within these various groups the projects range quite widely. The subject of soils and fertilizers includes investigations on the nutritive requirements of plant growth and factors affecting them, the availability and utilization of plant nutrients in soils under different methods of treatment, the toxicity of soils due to various

causes, and the nature and formation of humus. Other projects deal with the physical-chemical aspects of soil acidity; the influence of rotations on maintenance of soil fertility; problems of alkali soils and their treatment; the importance and action of sulfur, manganese, and magnesium compounds in the soil; fundamental soil moisture constants; and a variety of studies on the bacterial activity of soils, factors influencing it, and relationship to fertility.

The water requirements of crops as related to plant characters and environmental factors, the influence of soil types and of fertilizers on the composition of crops, relation of light to plant response, the duty of water on crops as affected by various conditions, and factors influencing the growth and development of special plant parts, such as cotton buds and bolls, constitute another group. Conditions which affect the milling strength and baking qualities of wheat flour form the subjects of several projects, while others are devoted to biochemical changes due to various causes, such as frosting of wheat, and their effects on bread-making quality and market value. There are physiological studies relating to changes in the ripening of crops and in their storage and transportation, the latter notably with sweet and Irish potatoes. Of interest to range agriculture are numerous projects on the toxic properties of poisonous plants and the stage of growth at which they are particularly dangerous, and studies of the injury to grazing tracts by rodents and the means of their control.

The work in genetics, which from the first has been a favorite field, includes both plants and animals. Under the former come studies of general principles, the laws and modes of inheritance, the value of mutations, linkage relations and variability, and the application of breeding principles in the systematic improvement of a great variety of field crops and fruits. With animals, the breeding work includes such subjects as inbreeding, inheritance of milk production and associated characters in cattle, analysis of hereditary factors determining milk and meat production, principles involved in fixing certain desirable characters in sheep, inheritance of fleece characters in purebred and crossbred sheep, fecundity of swine and conditions affecting it, cause and control of sterility in mares, and inheritance and physiology of various qualities in poultry.

The subject of plant diseases and similar troubles has always been one of very active attack, as already indicated. A wide range of diseases affecting a large variety of plants are under study as to their pathological, biological, and physiological relationships, as well as means of control. Mosaic diseases of crops, the degeneration troubles in potatoes, the means of transmission of disease in obscure instances, and the basis or nature of resistance and susceptibility occupy a prominent place. Notable among the latter are studies of the relation of nutritional deficiencies to prevalence of corn rots, the influence of

temperature and moisture conditions on plant infection, and the physiological aspects of parasitology as a key to the occurrence of these troubles. The biologic or physiologic forms and races of disease organisms and conditions producing them are the subject of another important series of investigations.

The study of economic insects, the factors influencing outbreaks, parasitic enemies, and other means of control have always constituted a prominent feature of the Adams fund program. The present list of such studies is a long one. In addition to the detailed investigation of individual insects and groups, a dozen or more projects relate to the chemical and physical properties of insecticides and fungicides, the manner in which they operate, and their effect on foliage; while others deal with insect attractants and repellents in relation to their chemical nature and arsenical residues on fruits—the means of removal and effect on storage.

It is gratifying to note that after a somewhat belated start, horticulture comes in for a goodly number of thoroughgoing investigations. Many of these relate to the physiological manifestations in the group of plants it represents, such as the nutrition of apple trees, the influence of fertilizer applications on the physiological functions of the tree, fertility and sterility of varieties, fruit bud formation, pruning in relation to growth and as a factor in blooming and the setting of fruit, value of bud selection in the apple, factors determining hardiness, and the nature, cause, and prevention of winter injury.

The subject of vitamins, which has been so richly contributed to by the stations, continues to receive much attention, including not only studies of their relation to proper nutrition but factors which affect them, such as conditions of growth and curing of crops, effect of commercial processes in condensing milk, relation to breed of cows, and capacity of storage in the animal body. Other nutrition studies pertain to the nature and value of proteins from various sources, the requirements of protein and energy for different purposes, the importance of ash ingredients, mineral metabolism and mineral requirements, basal metabolism studies, protein storage in protoplasmic tissue, and a long list of other fundamental investigations in nutrition, many of which have applications to man. There are numerous studies on the physiology of milk secretion, the chemistry of milk and its constituents, dairy and creamery sanitation, factors causing sandiness and swell in ice cream, and tolerance and nutritive value for children of milk of varying composition.

With poultry there are projects relating to feeding and management as affecting the vigor of germ in hen's eggs, effects of deficiencies of feed of hens on the vitality of chicks, conditions of incuba-

tion, and the nature and cause of watery whites in eggs. Most prominent among the studies of animal diseases are abortion, hog cholera, tuberculosis, and white diarrhea of chicks, but in addition a considerable list of other diseases affecting various kinds of livestock are under active investigation.

The above survey is in no sense exhaustive, but affords an idea of the range of the research and the fundamental subjects with which it is dealing. Its significance is not confined to agriculture itself, but in large measure the studies are of very vital importance for the welfare of the human race in its proper feeding and the maintenance of health, as well as the means of meeting the prospective demands of an increasing population.

A measure of the influence which the Adams Act is exerting on agricultural research might be sought by attempting to visualize the station programs with these various projects omitted or confined to their more popular phases. This does not mean, of course, that all the more advanced activities in these lines are confined to Adams projects, for many of the stations are spending on such research many times their Adams allotment of $15,000 per year. It would be difficult and withal not particularly profitable to attempt to segregate the precise returns from the Adams dollars from those derived from other sources, so intimately have they become intermingled in the warp and the woof of the fabric which the stations have been weaving in the past generation.

Probably the outstanding result of the Adams legislation has been its stimulating influence on the remainder of the station work, an influence far in excess of its contribution to the station treasury. This it has done by setting up and maintaining relatively high standards and demonstrating by its concrete achievements that ultimately the returns are larger from this slower but more substantial and conclusive type of investigation. Thus the first 20 years have resulted in raising appreciably the level of all agricultural experimentation. So far from pauperizing or even diminishing the responsibilities of the several States, as is sometimes feared may result from a Federal subsidy, this legislation has furnished an excellent example of a Federal appropriation which has brought about a stimulation and an increased development which is of general advantage to all.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The proteins of green forage plants, I–IV, W. L. Davies (*Jour. Agr. Sci. [England], 16 (1926), No. 2, pp. 280–301; 17 (1927), No. 1, pp. 33–43*).—The results are presented of four studies on the proteins of fresh vegetable tissues, in which it was sought (1) to characterize the purified protein, comparing this when possible with the seed protein of the same or a related species; (2) to determine the nature of the nonprotein nitrogen; and (3) to secure information upon other components of the extracts, such as soluble ash, sugars, pectinous substances, and mucilages. The literature is briefly reviewed in the introductory paper.

I. *The proteins of some leguminous plants* (pp. 280–292).—Alfalfa, sainfoin, vetch (*Vicia sativa*), red clover, and crimson clover (*T. incarnatum*) were studied. The general method was to bring about a cytolysis of the finely ground tissue by treatment with ether-saturated water, as proposed by Chibnall and Schryver (E. S. R., 47, p. 109), and to precipitate the protein from the aqueous solution of liberated cell contents either by adding successively increased percentages of alcohol or by heat coagulation. The pulp was reextracted with water until no further removal of protein was indicated, after which the residual protein was in some cases extracted with hot or cold alcoholic alkali. The preparations were purified by solution in dilute aqueous alkalies, carbonate or hydroxide, and reprecipitation with acid. It proved advantageous to freeze some of the tissues before extracting them.

The dried protein preparations were greenish, dusty powders having the characteristic properties of vegetable protein preparations. They yielded an ash containing principally calcium, magnesium, sulfate, and phosphate. The nitrogen distributions of the preparations were determined by the Hausmann and the Van Slyke methods. The lysine, as determined by the latter method, varied from 3.5 (red clover) to 9.4 per cent (one of the vetch protein preparations). Cystine varied from 0.9 (one of the vetch protein preparations) to 1.8 per cent (an alfalfa protein preparation), arginine ranged from 6.0 (a sainfoin and one of the vetch protein preparations) to 9.3 per cent (an alfalfa protein preparation), and the histidine percentages were from 2.1 in one of the vetch protein preparations to 8.5 in a preparation from red clover. Amide nitrogen in the protein-free extracts was constant, but ammonia nitrogen was variable.

II. *The proteins of the mangold root; comparison with the proteins of mangold seed* (pp. 293–301).—Methods similar to those above noted in connection with leguminous plant tissues were used, with the exception that it was found necessary to hold the mangolds in storage for eight weeks since otherwise little coagulum was obtained from the extracts. Preparations containing about 11 to 12 per cent of nitrogen were obtained. They were dusty, slate gray powders, and responded to all the protein tests. They also contained carbohydrate, as indicated by the Molisch test. The ash contained calcium, sulfates,

and phosphates, with traces of iron, magnesium, and chlorides. The average diamino acid contents of two preparations were: Arginine 7.9, histidine 3.2 lysine 5.7, and cystine 1.8 per cent. The percentages of diamino acids found in two globulins (A and B) from the mangold seed were: Arginine 10.73 and 13.65; histidine 6.53 and 2.28; lysine 1.32 and 2.17, and cystine 2.63 and 2.69, respectively. A trace of albumin was found to be present in the 10 per cent sodium chloride extracts of ground mangold seeds. The elementary analyses of the two seed globulins showed them to differ principally in the sulfur content, globulin A containing 1.01 per cent of sulfur and globulin B 0.41 per cent.

III. *The proteins of forage plants of the natural order Cruciferae (Genus Brassica); comparison with colzalin, a globulin from rapeseed* (pp. 33-40).—Protein preparations were obtained by coagulation from the filtered press juice of the minced leaves of cabbage, kohl-rabi, narrow stem kale (leaves and stems), and turnips (leaves and roots). Preparations were also obtained from the press cake of the cabbage and turnip leaves by extracting with 0.2 per cent alcoholic sodium hydroxide at 70° C., the protein being precipitated by acidification. The nitrogen distribution and the basic amino acid content of the preparations as determined by Van Slyke's method are compared with those of colzalin, a globulin from rapeseed (*B. rapa*). "It is apparent that the quantities of diamino acids do not suffer a change" when the protein is stored in the seed, and that "an analysis of a seed protein would give a fair indication of the diamino acid content of the protoplasmic protein of the same species."

IV. *The proteins of some plants of the natural order Umbelliferae* (pp. 41-43).—Carrots and parsnips were studied. The protein was extracted by methods similar to those used for other fleshy vegetable tissue. Certain marked differences between the proteins of the two roots were found. The carrot protein contained the larger percentage of monoamino nitrogen, the parsnip protein having the larger percentage of proline and oxyproline, and the carrot protein more arginine and less histidine than the parsnip protein. The sums of these basic amino acids, however, were roughly the same in the two proteins, so that no difference in nutritive value can be attributed to this difference, arginine and histidine being biologically interchangeable.

On the phosphorus nucleus of casein [trans. title], S. Posternak (*Compt. Rend. Acad. Sci.* [*Paris*], *184* (*1927*), *No. 5, pp. 306, 307*).—In the tryptic digestion of casein a polypeptide containing 4 atoms of phosphorus and 18 atoms of nitrogen was obtained. This compound contained the greater part of the phosphorus of the casein and was very resistant to trypsin. With a very active pancreas preparation, however, it was possible to isolate compounds containing 16 and 15 atoms of nitrogen to 4 of phosphorus. The simplest of these products crystallized from dilute alcohol and furnished material for a study of the phosphorus nucleus of casein. The three compounds obtained were designated α-, β-, and γ-lactotyrines, were soluble in water, were strongly acid to methyl orange, formed water-soluble salts with the alkaline earth metals as well as with the alkalies, were strongly levorotatory, and gave a rose color in the biuret reaction, but no colorations with the Millon, Molisch, and xanthoproteic reactions. Caustic alkalies and baryta very slowly separated almost all the phosphorus from these compounds as phosphoric acid at room temperature. This reaction became rapid on boiling. α-Lactotyrine was hydrolyzed with difficulty and only with some deamination, yielding, beside ammonia and pyruvic acid, 3 molecules of glutamic acid, 0.6 of aspartic acid, a little more than 3 of isoleucine, about 8 molecules of serine, and 4 molecules

of phosphoric acid, together with small quantities of dipeptides and larger quantities of tri- and tetra-peptides. In accordance with the structure assigned to α-lactotyrine, it should show 12 acid equivalents on titration. With phenolphthalein as indicator, 11.6 acid equivalents were found. The apparent structure of α-lactotyrine indicates that the phosphorus nucleus of casein consists of serine-phosphoric acid residues.

A study of the effect of heat upon wheat and flour, especially in relation to strength, D. W. KENT-JONES (*Dover, Eng.: Dover Ptg. and Pub. Co., 1926, pp. 116, pls. 9, figs. 2*).—Flour can be subjected to considerable heating without altering the baking strength, but too high a temperature or too prolonged a treatment will ruin the baking qualities entirely. Between these extremes there is a region within which the heat treatment of a flour greatly enhances the baking strength. These facts are illustrated in a chart of temperature plotted against period of heating, the curves delimiting the regions of negative, beneficial, and deleterious effects. Suitable heating increases imbibitional power, reduces the protein soluble in 5 per cent aqueous potassium sulfate, reduces the Lintner value, and markedly reduces proteolytic activity. It has little or no effect upon the "a" and "b" quality factors of Sharp and Gortner (E. S. R., 50, p. 502), upon gas production or maltose content, upon the isoelectric point of the gluten, or upon the racemization of the glutenin. Heating apparently increases the baking strength by increasing the swelling power of the proteins. Selection and cultivation of wheat for high protein content, together with heat treatment of the weaker grades, is recommended as a means for the production of a strong English flour. Various chemical methods for the determination of flour characteristics were tested and compared, and the relative value of these methods is discussed.

An introduction reviews the literature and discusses the terminology of the subject, and a considerable bibliography is appended.

The chemical composition of Tunisian olive oil, G. S. JAMIESON, R. M. HANN, and W. F. BAUGHMAN (*Oil and Fat Indus., 4 (1927), No. 2, pp. 63–65*).—The chemical and physical characteristics of the Tunisian oil are tabulated in comparison with those of the Italian and California oils previously examined (E. S. R., 54, p. 610). A determination of the glycerides of oleic, linolic, myristic, palmitic, stearic, and arachidic acids showed that the Tunisian oil contained 14 per cent less oleic glyceride, about three times as much linolic glyceride, and about twice as much palmitic glyceride as either the Italian or California oils.

A chemical method for determining the phosphoric acid requirements of agricultural soils [trans. title], A. NĚMEC (*Compt. Rend. Acad. Sci. [Paris], 183 (1926), No. 4, pp. 314–316*).—The water soluble phosphoric acid, colorimetrically determined by reducing phosphomolybdic acid with hydroquinone and subsequently developing a blue color with sodium sulfite in alkaline solution, has been correlated with the soil requirement of phosphatic fertilizers for certain crops. Soils containing 35 mg. or more per kilogram of water-soluble P_2O_5 in the air-dried samples satisfied the phosphate requirements of sugar beets. Barley did not respond to phosphatic fertilizers when the soil contained 22 mg. per kilogram of water-soluble P_2O_5. Potatoes required but 19 mg. per kilogram, and 15 mg. per kilogram supplied the needs of oats.

The determination of arginine in pure proteins and in the tissues by a modification of Jansen's method [trans. title], A. BONOT and T. CAHN (*Compt. Rend. Acad. Sci. [Paris], 184 (1927), No. 4, pp. 246, 247*).—Three gm. of dried tissue free from extractives and fat or 3 gm. of pure protein are hydrolyzed 48 hours with 60 cc. of 20 per cent hydrochloric acid. The solution is evaporated

to dryness on a water bath under reduced pressure to remove the acid. The residue, taken up in hot water, is transferred to a porcelain dish. This is heated to boiling with 0.5 gm. of a very pure and active animal charcoal, which removes the humin nitrogen and decolorizes, without absorbing, the arginine. The solution is filtered, and evaporated to dryness on the water bath to remove traces of hydrochloric acid. It is taken up again in water and made up to a volume of 250 cc., the reaction being made as exactly pH 9.9 as possible, using 2.5 N sodium hydroxide.

Arginase is allowed to react on the clear solution. The enzyme is prepared by precipitation with acetone from the juice pressed from dog liver. Its activity is determined on a solution of pure arginine. It is always desirable to use an excess of arginase.

The reaction is allowed to continue for 72 hours at 37° C. The large quantity of amino acids contained in the mixture acts as a buffer, so that the pH value does not change during the action of the ferment. In a mixture which contains no monoamino acids, it is necessary to use a suitable buffer solution, for instance, 1.5 gm. of glycine, in its determination. The mixture is neutralized with dilute acetic acid, is filtered, and evaporated on a water bath under reduced pressure below 70° to avoid hydrolysis of the urea. The residue is taken up in 70 per cent acetic acid and treated with a few drops of clarifying agent to remove remaining traces of protein coming from the arginase solution. The solution is then centrifuged.

The clear liquid is transferred to a beaker, and precipitation is secured by adding an excess of a 10 per cent solution of xanthydrol in methyl alcohol. The condensation and the precipitation of the dixanthydrol urea are complete in 10 hours. The precipitate is filtered off by suction and is washed with a little methyl alcohol saturated with xanthydrol urea. It is dried at 100° and weighed. Multiplying the figure for the urea by 0.414 gives the weight of the arginine.

Two trials of this method, in which were used in each case 0.150 gm. of arginine, gave the figures 0.147 and 0.148 for the arginine recovered. Arginine added to albumins was recovered with the same accuracy after hydrolysis. In general the error is less than 2 per cent.

The preservative action in catsup of salt, sugar, benzoate, and acid, C. S. Pederson and R. S. Breed (*New York State Sta. Bul. 538 (1926), pp. 15*).—Sixteen brands of catsup showing decided variations in acid, sugar, and salt content were inoculated with 32 cultures of 5 quite distinct types of bacteria, all of them nonspore-forming, Gram-positive rods isolated from spoiled tomato products, and with 2 yeast cultures from the same source. Four of the 5 bacterial types produced acid and gas, causing swells in tomato products. The fifth formed slime and acid without gas in tomato products. With the exception of *Lactobacillus lycopersici* Mickle, none were identified with previously described organisms, although some may be closely related to, or identical with, *Bacillus pleofructi* Savage and Hunwicke (E. S. R., 51, p. 261). One per cent of acetic acid, 5 per cent of salt, or 0.2 per cent of sodium benzoate were required to stop the growth of all of the bacteria tested, but certain types were less resistant. Sugar has little effect, 35 per cent inhibiting the growth in certain types only. Sugar and salt combined were very effective; 15 per cent of sugar and 3.5 per cent of salt inhibited all save one yeast. Neither sugar nor salt, however, appreciably lowered the inhibitory concentration of acid.

How to make and preserve cider, F. W. Fabian (*Michigan Sta. Circ. 98 (1926), pp. 20*).—The various apples commonly used for cider making are classified into five groups: (1) Acid to subacid, (2) subacid to mild, (3) aromatic,

(4) astringent, and (5) neutral. Percentages of these groups which may be combined to produce finely flavored ciders are suggested. The usual practices and apparatus used in the preparation of high-grade ciders are described, a flow sheet is given, and Federal regulations governing the manufacture and sale of cider and similar products are quoted.

The determination of the isoelectric point of wool and silk.—Applications [trans. title], L. Meunier and G. Rey (*Compt. Rend. Acad. Sci.* [*Paris*], *184* (*1927*), *No. 5, pp. 285–287, fig. 1*).—Two-gm. samples of wool or of scoured silk were immersed at the laboratory temperature in buffer solutions of pH values from 1 to 10 and left until equilibrium was established, usually in about 40 hours. The equilibrium pH of the solutions was then determined. The water mechanically held in the samples was removed by centrifugalization and the weight of the swelled fiber obtained. The difference between this weight and that of the absolutely dry fiber was taken as a measure of the swelling.

A curve, in which the equilibrium pH values are plotted as abscissas against the corresponding percentages of swelling as ordinates, is given. The minimum swelling in the case of wool was found to take place between the pH values 3.6 and 3.8. The values obtained with silk fiber were less definite, but indicated a minimum swelling in the neighborhood of pH 4.2. The shrinking of wool and silk fibers and the felting tendency of wool were least in liquids of a pH value corresponding to the isoelectric points of the fibers.

Waste sulphite liquor as an agricultural spray, C. S. Fleming and J. H. Reedy (*Chem. and Metall. Engin.*, *34* (*1927*), *No. 3, p. 159*).—Calcium bisulfite is reduced by hydrogen sulfide with the formation of a sulfur-calcium sulfide mixture closely resembling lime-sulfur spray in composition, and the 7 to 9 per cent of organic matter, mostly a sugar-like substance, peptizes the sulfur rather well. The addition of 0.5 per cent of gelatin or of corn sugar enormously improves peptization so that the suspensions last for days and may be almost perfectly restored at any time by agitation. Small scale spraying experiments have been successful. The organic matter increases adhesiveness both directly and by the peptizing tendency. To cut shipping costs the sulfur can be precipitated by hydrochloric acid or other strong electrolyte and filter-pressed to a gummy solid which is easily wetted and resuspended. The filtrate from this operation contains fermentable sugars and can be utilized for the manufacture of alcohol.

METEOROLOGY

The Brückner cycle in the United States, A. J. Henry (*Bul. Amer. Met. Soc.*, *8* (*1927*), *No. 1, pp. 17–19; U. S. Mo. Weather Rev.*, *54* (*1926*), *No. 12, p. 507*).—This is an abstract of a paper in which it is stated that an examination of data for rainfall and temperature during the nineteenth century did not tend to confirm Brückner's conclusion that groups of cold and wet and of warm and dry years succeed each other in a cycle having an average length of 35 years. On the other hand, it indicated that "both temperature and precipitation oscillate up and down in an irregular manner, but on the average in intervals of 7 to 10 years counting from maximum to maximum or minimum to minimum. In extreme cases the interval may be as long as 22 years and longer if one considers only the changes of great amplitude; there is, moreover, a lack of uniformity in the distribution of warm and cold, wet and dry years which increases as the area under consideration increases. Dry years are much more frequent in the United States and doubtless other countries than wet ones."

Effect of local influences in modifying the general atmospheric conditions, A. Smith (*U. S. Mo. Weather Rev.*, *54* (*1926*), *No. 11, p. 465*).—A statis-

tical study of rainfall and temperature to ascertain whether the sandy nature of the soils in central Wisconsin exerts any marked influence on these two climatic factors showed that the influence, if any, is too small to be detected by the methods used.

Monthly Weather Review, [November–December, 1926] (*U. S. Mo. Weather Rev., 54 (1926), Nos. 11, pp. 453–484, pls. 13, fig. 1; 12, pp. 485–529, pls. 20, figs. 14*).—In addition to detailed summaries of meteorological and climatological data and weather conditions for November and December, 1926, and bibliographical information, notes, abstracts, and reviews, these numbers contain the following contributions:

No. 11.—A. Ångström on "The Albedo of Various Surfaces of Ground," by H. H. Kimball; Graphical Thermodynamics of the Free Air (illus.), by E. W. Woolard, L. T. Samuels, and W. R. Stevens; Waves and Vortices on a Quasi Stationary Boundary Surface over Europe, review by H. Willett; Results of Aerological Observations Made at Various Stations in the Netherlands during 1924, review by L. T. Samuels; The Direction of Wind and Cloud over Teneriffe, trans. by B. M. Varney; Weather and Hay in New York State (illus.), by W. A. Mattice (see p. 714); The Tornado in Southern Maryland, November 9, 1926, by T. R. Brooks; and Effect of Local Influences in Modifying the General Atmospheric Conditions, by A. Smith (see p. 712).

No. 12.—Application of the Polar-Front Theory to a Series of American Weather Maps (illus.), by C. G. Rossby and R. H. Weightman; "The Glacial Anticyclones:" A Review, by C. F. Brooks; Notes on Formulas for Use in Forecasting Minimum Temperature (illus.), by E. S. Nichols; The Tornado, by W. J. Humphreys; Thunderstorms at Lander, Wyoming, by McL. S. Collom; and The Weather of 1926 (illus.) (see below).

Climatological data for the United States by sections, [November–December, 1926] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 13 (1926), Nos. 11, pp. [190], pls. 4, fig. 1; 12, pp. [194], pls. 4, fig. 1*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for November and December, 1926.

The weather of 1926 (*U. S. Dept. Agr., Weather Bur., Weekly Weather and Crop Bul. 2 (1927), pp. 1–4, figs. 4; also in U. S. Mo. Weather Rev., 54 (1926), No. 12, pp. 504–506, pls. 2*).—Monthly and annual departures of temperature and precipitation from the normal during the year in different sections of the country are shown graphically and in tables.

It is stated that "for the country as a whole no marked unusual features as affecting agricultural interests were experienced. Conditions were rather unfavorable for development of some of the major crops, but were unusually favorable for others, with the general results as to yields satisfactory. More than half the country had for the year less than normal precipitation, more than normal warmth, and a longer than normal growing season. . . .

"Wheat came through the mild winter with no material harm, which, together with the subsequent favorable weather, resulted in an unusually good crop of the winter variety; likewise the general absence of damaging frost was responsible for one of the largest fruit yields in the history of the country, and the widespread favorable weather in the South gave an unprecedentedly large crop of cotton. Conditions were somewhat less favorable for corn, though the per-acre yield was only slightly below the preceding 10-year average, while heat and drought materially reduced the yield of spring wheat. . . . The composite yield of all crops was below the 10-year average from the central Great Plains and lower and middle Mississippi Valley northward, slightly below in two South Atlantic States and Nevada, and generally above normal elsewhere.

Of the 48 States, 34, comprising approximately two-thirds of the area of the country, had a composite yield of crops above the 10-year average. . . . A feature of the weather in northern districts, which also penetrated southward to include the middle Mississippi Valley, was the more than usual cloudiness."

Weather and hay in New York State, W. A. Mattice (*U. S. Mo. Weather Rev., 54 (1926), No. 11, p. 461, fig. 1*).—Correlating the rainfall and temperature of the growing season with yields of hay for the period 1894–1923, the author found that the most important factor in determining yield is the rainfall from April to June, inclusive, and the second in importance is the May and June mean temperature. The estimate of yield as computed from weather factors averaged 47 per cent closer than the deviation of yield from the average.

SOILS—FERTILIZERS

Soil conditions and plant growth, E. J. Russell (*London and New York: Longmans, Green & Co., 1927, 5. ed., pp. VIII+516, pls. 6, figs. 42*).—In the preparation of this fifth edition (E. S. R., 46, p. 809) all except the historical portions of the book have been rewritten. The most striking advances in soil study since 1921 appear to have been in the chemistry of soils. The developments in the pure chemistry and physics of colloids have opened possibilities, immediately made use of, for further advance in soil chemistry. Investigations in bacteriology and physics have also advanced the application of these sciences to the study of the soil.

The book contains chapters on soil conditions affecting plant growth, the composition of the soil, chemical relationships, the carbon and nitrogen cycle, soil population, biotic conditions, methods of examination, etc. Methods of analysis and a selected bibliography of about 320 references are given in appendixes.

[Soil and fertilizer work at the Wisconsin Station, 1924–1926] (*Wisconsin Sta. Bul. 388 (1926), pp. 50–59, figs. 3*).—The following work is reported:

Fertilizer value of activated sludge.—In greenhouse plat experiments activated sewage sludge proved a better source of nitrogen for corn grown in quartz sand than did digested leather, and was about equal to tankage, cottonseed meal, and dried blood. In field experiments sludge compared favorably with tankage and with ammonium sulfate as the sole source of nitrogen for sweet corn, cucumbers, and pumpkins, and with tankage for cabbages. The sludge was also effective for potatoes, though slightly less so than tankage or ammonium sulfate. The largest increases were usually obtained with mixtures having both organic and inorganic nitrogen, under which conditions the sludge was quite as effective as tankage. Sludge proved a good source of nitrogen for golf courses and lawns, satisfactorily replacing manure in the usually used top-dressing mixtures. It is weed-free, requires neither composting nor screening, contains more phosphoric acid and nitrogen than manure, and possesses, in common with the other organic nitrogen carriers, the colloidal nature and absorptive capacity which favorably affect the mechanical condition of soils and improve the conditions for bacterial activity, and its nitrogen is not subject to rapid leaching. Commercial greenhouse trials of sludge in the past year have produced increases of from 10 to 30 per cent in the number of blooms on carnations, and an increase of 686 blooms per 1,000 sq. ft. on roses. O. J. Noer was in charge of the field and laboratory work.

Fertilizer trials on peat at Coddington.—In experiments prior to 1926 potatoes were fertilized at Coddington with mixtures containing either 200 or 150 lbs. of potash. By applying 400 lbs. of muriate, Early Ohio potato yields were increased from 150 bu. for the preceding three years to 312 bu., the potash

being half broadcast and half in rows. By a 400-lb. broadcast alone, 250 bu. per acre were obtained. The yields for 1926 of oats, peas, and carrots are also noted.

Fertilizer tests at Marshfield.—Experiments to determine if the supplementing of manure with commercial fertilizers would give corn an earlier start on the Colby silt loam showed that when hill dropped at the rate of 200 lbs. per acre in conjunction with 8-ton manure applications all resulted in an earlier spring start, maturity from 10 days to 2 weeks earlier, and an increase in yield from 58.65 bu. with manure alone to nearly 75 bu. The most economical manure supplement was 16 per cent acid phosphate.

Potato trials at Ashland.—Supplementation of 8-ton manure applications with 400 lbs. of 16 per cent acid phosphate increased the yield of potatoes grown on a belt of red clay with tracts of sandy loam overlying the clay from 212.5 bu. produced with the manure alone to 299.4 bu. Potash fertilizers appeared to be also especially good for potatoes on this soil.

Alfalfa continues to succeed at Hancock.—Additional lime had no effect upon stand or yield at the Hancock Substation, the liming of 1917 still remaining adequate. Acid phosphate alone or with manure gave no increase, but phosphate supplemental to 300 lbs. of muriate of potash showed increases in proportion to the phosphate. Potash gave important increases alone, with manure, or with phosphate. The duration of the effect of the potash remains to be determined, but 200 to 300 lbs. appears sufficient for one or two crops of alfalfa.

Studies of soil solutions.—A study by E. Truog of the effect of moisture conditions upon the mineral element concentration of soil solutions showed an initial marked decrease on the addition of water, followed by a slight increase prior to the establishment of apparent equilibrium. The manner of moistening does not appear to affect the final concentration, but stored soils give a much higher concentration than do those fresh from the field, the effect of storage being independent of the moisture content over a considerable range. In an uncropped field soil the total quantity of salts in solution was constant over long periods. The concentration of total salts of calcium and, to a less degree, of magnesium varied inversely with the moisture content. The potash and phosphoric acid concentrations showed no variation with the moisture content.

Determining the H-ion concentration of soils.—The electrometric method was found by Truog and W. H. Pierre unsuited to ordinary soil extracts and solutions but could be used with soil suspensions. The colorimetric method was found suitable and convenient for perfectly clear extracts and solutions, such as may be obtained by filtering through washed filtering paper with special suction apparatus. Centrifuging does not clarify all soil extracts, and stoppered containers must be used in centrifuging to avoid a decrease in acidity by exposure to the air. As the reaction of extracts and solutions changes on standing, determinations must be made without delay, and well-weathered glassware should be used. Neutral indicators are necessary, and, if grinding is required, agate mortars and pestles must be used, since glass and porcelain contaminate the indicators with alkaline substances.

The effect of carbonic acid on the H-ion concentration of soils.—Adding carbon dioxide at the bottom of a soil suspension increased the H-ion concentration, but in displaced soil solutions from either acid or alkaline soils bearing growing plants the H-ion concentration was the same as in these soils when uncropped. The pH of an actual soil solution does not appear to be affected significantly by carbon dioxide from plant roots or from decomposing organic matter.

The effect of the soil-water ratio on the H-ion concentration of soils and the nature of soil acidity.—The pH of some soils is not affected by changing

the soil–water ratio from 1:2 to 1:50, and soils whose pH is affected show no such effect after the soluble salts and the more soluble acids are washed out. These experiments support the theory that soil acidity is due principally to such relatively insoluble mineral acids as silicic and alumino-silicic. At equilibrium the soil solution is saturated with these relatively insoluble acids, and as long as some remain undissolved the pH is the same for different soil–water ratios.

Potato experiments at Spooner.—Manure at the rate of 9 tons per acre was found by F. L. Musbach to give excellent results with potatoes grown in sandy soil. Supplementing with commercial fertilizers slightly increased the yield, and may be economical when potato prices are good.

Soil survey of Reeves County, Texas, M. W. BECK and W. W. STRIKE (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+1257–1294, pls. 2, fig. 1, map 1*).—In this survey, made in cooperation with the Texas Experiment Station, the soils of an area of 1,661,440 acres in southwestern Texas near the New Mexico line are classified and mapped. The area slopes in general toward the east and southeast. It has a fairly well-established drainage and lies from 2,400 to 5,000 ft. above sea level. The average annual precipitation is about 11 in., of which more than one-half usually falls within the period July to October, inclusive.

Three distinct soil groups were found: (1) Upland soils of the outwash-plain region, (2) residual soils from the igneous and limestone rocks, and (3) first-bottom soils, representing recent alluvium. Excessive alkali was found in many of the soils, most of which, however, can probably be reclaimed by ditching and flooding. The soils have been classified and mapped in 8 series of 10 types, the Reeves silty clay loam, the Reeves gravelly loam, and the Verhalen clay occupying, respectively, 33.2, 27.0, and 12.1 per cent of the area, with rough stony land, unclassified, amounting to 4.5 per cent.

The agricultural characteristics of the south chernozem, dark chestnut, and alkali soils of the Saratov experiment region [trans. title], M. S. KUZ'MIN [KOUSMIN] (*Zhur. Opytn. Agron. Iugo-Vostoka* (*Jour. Expt. Landw. Südost. Eur.-Russlands*), *3* (*1926*), *No. 1, pp. 16–31; Eng. abs., p. 31*).—Statistical methods and an investigation of soil dynamics were utilized in a study of the values of three principal soil types at the soil laboratory of the Saratov Experiment Station. All three were comparatively rich, their differences arising principally from the physical nature of their origins. In the alkali soil, in spite of the supposedly poor aeration of its compact horizon, the mobilization of the nutrient supply is adequate, but unfavorable moisture conditions appear to limit the development of its potential productiveness. The limiting factor in the case of the dark chestnut soil seems to be the compact horizon. Its conditions with respect to aeration, moisture, and nutrients are unfavorable to the lower horizons. Some correlation was found in comparing the character of the exchangeable base with the physical properties in the south chernozem, dark chestnut, and alkali soils.

Black and white alkali soils of Asiatic Siberia and Turkestan, K. D. GLINKA (*Solontsy i Solonchaki Aziatskoi Chasti SSSR* (*Sibir i Turkestan*). *Moscow: "Novaiă Derevniă," 1926, pp. 74*).—A detailed account of the various types of alkali soils of Siberia and Turkestan is given. These soils are classified into zones as follows: Podsol, chernozem, chestnut, brown, and gray. The profile, structure, horizon, mode of formation, vegetation, and geographic distribution of each zone are described. The formation of black alkali is traced in each case. In certain cases, where precipitation prevents the accumulation of soluble salts, black alkali is formed from white alkali, but black alkali is not

necessarily derived from white alkali. The podsol zone contains sulfate soils, the chernozem zone carbonate soils with a considerable sulfate, the chestnut and brown zones sulfate and chloride soils, and the gray zone primarily sulfate soils.

The phenomena of contraction and expansion of soils when wetted with water, G. J. BOUYOUCOS (*Soil Sci., 23 (1927), No. 2, pp. 119–126, fig. 1*).—In a series of experiments at the Michigan Experiment Station, three distinct modifications of the dilatometer method were tested, and a specially constructed dilatometer was used. A contraction on wetting varying with the character of the soil was observed, the organic constituents showing the greatest contraction. The volume contraction showed a close relationship to both organic matter content and the heat of wetting. The relationship to the colloid content was not so close and consistent. The contraction is attribued principally to surface condensation of some of the water upon the soil particles or colloids, but a small part may be caused by hydration.

The moisture equivalent of heavy soils, II, A. F. JOSEPH (*Jour. Agr. Sci. [England], 17 (1927), No. 1, pp. 12–20*).—Experiments are described, in continuation of a previously noted study (E. S. R., 50, p. 421), on the extent to which the moisture equivalent is an additive property, dependent on the nature of the fractions under the modifying influence of electrolytes and possibly humus. The moisture eqnivalent of pure clay varies with (1) the chemical composition, (2) the method of separation, if the material be centrifuged, and (3) the replaceable bases. The imbibitional water content also shows a close connection with the same variables. Good additive relationships can only be obtained from series of soils of the same nature and sometimes only if these be taken at the same depth. This is at least partly due to differences in composition and properties between the clays of soils and subsoils. Pure silt fractions from different soils differed markedly in chemical composition and moisture content.

Effects of some electrolytes on kaolin and the probable relation to the soil, J. R. SKEEN (*Soil Sci., 23 (1927), No. 3, pp. 225–242, figs. 4*).—A preliminary physicochemical study, at the University of Pennsylvania, on the behavior of kaolin in solutions of certain electrolytes, with the object of explaining the formation of the hardpan in acid clay soils, is discussed. Data are presented for their comparative value only on the turbidity of supernatant solutions, on the final volume of kaolin sedimented from various solntions, on the conductivity of solutions, and on the sign and intensity of the particular charge. Various concentrations of hydrochloric acid, sodium hydroxide, sodium chloride, sodium sulfate, sodium citrate, barium, calcium, and aluminum chlorides, sucrose, and urea were used.

The aluminum ion clears the supernatant liquid in dilute solutions immediately after shaking, whereas the citrate and sulfate ions stabilize the suspension. There is some correlation between turbidity and the final volume of sediment. The final sediment volume is generally much less in the most turbid solutions, but nearly all the aluminum solutions greatly increase the final sediment volume. Sucrose and urea do not affect kaolin. Only the aluminum and sodium ions flocculate kaolin, and the degree of flocculation appears to be independent of the particular charge. Hydrochloric acid is largely adsorbed at all dilutions, but none of the other electrolytes used was adsorbed from dilute solutions. Adsorption apparently is not a function of pH in clays. The aluminum concentration in the soil solution seems to depend both upon the phosphate content and upon the pH of the soil. A great decrease in either controlling factor may but slightly increase the dissolved aluminum; but a

slight decrease in both phosphate content and pH will greatly increase dissolved aluminum and iron. The formation of hardpan is tentatively attributed to an acid (about pH 5) solution of aluminum and iron at the surface. These elements, not being adsorbed by the clay, are carried down in quantities ultimately sufficient to flocculate the clay at some depth, dependent on the pH. The aggregated clay particles cause the formation of a tight layer about the aggregates of which, after drying, aluminum and iron are deposited as oxides mechanically binding an impermeable mass. Analytical evidence in support of this view is presented.

Differences in the heat of reaction between artificial and soil gels of silica, alumina, and iron, with hydroxides, G. J. Bouyoucos (*Soil Sci., 23 (1927), No. 3, pp. 243–247*).—Experiments are reported from the Michigan Experiment Station, in which it was found that the heat of reaction, as distinct from the heat of wetting, of soil colloids when treated with sodium and potassium hydroxides is very small in comparison with that of artificial gels of ferric hydroxide, alumina, and silica. Apparently the soil colloid gels of iron, alumina, and silica are either of a constitution, or in a state, quite different from that of the corresponding artificially prepared gels. This difference has not been brought out in determinations of the heat of wetting of soil and artificial colloids.

Fertility of a soil as related to the forms of its iron and manganese, P. H. Brewer and R. H. Carr (*Soil Sci., 23 (1927), No. 3, pp. 165–173, figs. 2*).—A study of the soil of the Scottsburg experiment field of Purdue University indicated the presence of a toxic substance, and showed most of the iron present to be in the ferric condition, not available to plants at a pH of about 6.0. This condition is largely counteracted by the reducing action of manures, but is not improved by commercial fertilizers. Manuring did not greatly alter the percentages of iron and manganese present, but the lower state of oxidation of these elements appeared the more favorable for plant growth, as indicated by annual increases of about one-third in corn and wheat yields and by an approximate doubling of the clover yield.

Testing soils for acidity by the modified Comber method, M. F. Miller (*Missouri Agr. Col. Ext. Circ. 184 (1926), pp. 4, figs. 2*).—Practical directions are given, together with a color chart and liming indications for several crops. Attention is drawn to the fact that no test for the lime requirements of soils is absolutely accurate. The modified Comber test is deemed as accurate as any and more satisfactory than most.

The organic matter in heavy alkaline soils, A. F. Joseph and B. W. Whitfeild (*Jour. Agr. Sci. [England], 17 (1927), No. 1, pp. 1–11*).—The composition of three soils from the Blue Nile, Khartum, and the Gezira, and the Upper White Nile, 100 and 800 miles south of Khartum, was studied. A modification of Beam's method for humus determination was used.

Sudan soils were found to be low in organic matter, the total organic carbon being usually below 1 per cent. Humus could not be obtained ash free. Specimens from widely different sources contain nearly the same percentage of carbon. Humus solutions in very dilute alkali keep fairly well in the dark, and in the light when air is excluded. Colorimetric standards may be used if not kept too long.

Field studies showed a greater humus content in good than in poor soils. There is a marked inverse connection between salt and humus content. This conclusion does not apply to the depth distribution, however. The total nitrogen of the soils studied was low. About one-fifth of the total was humus nitrogen. The carbon-nitrogen ratio was about 12:1.

The bacterial flora of serpentine soils, C. B. LIPMAN (*Jour. Bact., 12* (*1926*), *No. 5, pp. 315–318*).—Experiments at the University of California, forming a part of a study of the infertility of dominantly magnesian soils, are reported. These experiments included bacterial counts and a study of the nitrifying and nitrogen-fixing bacteria of three serpentine soils from the Mount Diablo region of California. The infertility of these soils was found to be due to a high pH and a deficiency in especially the nitrate and phosphate ions.

The bacterial population consisted principally of nonchromogenic forms, with very few fungi and Actinomyces. No active nitrifying flora were found, though a few Azotobacter cells appeared in one soil. The poverty in microorganisms is attributed to (1) ammonia deficiency, due in turn to deficiency in easily decomposed protein and like substances; (2) paucity in ammonia-forming organisms; (3) deficiency in available phosphoric acid; and (4) deficiency in carbon compounds.

Humus in Assam soils: Its depletion and means of recuperation, S. K. MITRA and L. N. PHUKAN (*Assam Dept. Agr. Bul. 1* (*1926*), *pp. 6*).—Seventeen Assam soils were examined for humus content. A table shows percentages of humus in the plains districts ranging from 0.66 (sandy soils) to 2.75 (clay soils). In alluvial plains subject to flood the natural silt is quite suitable for crop production. The burning of weeds and stubble instead of plowing them under, the washing of the soil during the monsoon rains, and the practice of the continuous one-crop system are assigned as principal causes of humus depletion in the Assam region. The application of farmyard manure, green manuring, liming of excessively acid soils, and rotation are recommended. Important leguminous crops which can be grown in rotation with sugar cane are listed.

[Soil fertility studies at the Arizona Station], C. N. CATLIN and A. E. VINSON (*Arizona Sta. Rpt. 1923, pp. 447–450*).—Treatment of two black alkali soils with various acid materials, including aluminum compounds, showed the sulfide and sulfate to be the only aluminum salts having a neutralizing effect on the black alkali.

The application of 100 tons of sulfuric acid on eight tracts in the Casa Grande Valley proved promising, but marked crop increases were obtained in only a few cases. Laboratory studies showed increased percolation, especially near the surface. The calcium sulfate formed on treating lime soil with sulfuric acid is in a finer and consequently more soluble condition than the gypsum ordinarily applied to alkaline lands. Calcium bicarbonate increased the percolation rate in "tight" soils.

Experiments in manuring, F. C. HAROLD (*Jour. Min. Agr.* [*Gt. Brit.*], *33* (*1926*), *No. 9, pp. 811–814*).—Experiments to determine the maximum economic outlay in phosphatic, nitrogenous, and potassic fertilizers on loam soil over freestone are briefly reported. The results appear to be primarily of local significance.

Note on the action of hydrogen peroxide on farmyard manure in different stages of decomposition, G. H. G. JONES (*Jour. Agr. Sci.* [*England*], *17* (*1927*), *No. 1, pp. 104–108*).—Six per cent hydrogen peroxide was used in experiments for the fractionation of soil organic matter into the humified and nonhumified portions. There appears to be a good correlation between the degree of decomposition of farmyard manure as indicated by its appearance and known history and the extent of humification as indicated by the peroxide treatment. "Degree of humification" might be used as a criterion of the condition of farmyard manures.

Fertilizers, E. B. VOORHEES, rev. by S. B. HASKELL (*New York: Macmillan Co., 1926, 2. ed., rev., pp. XIX+310, pls. 16, figs. 4*).—In this second revised edition (E. S. R., 36, p. 119) it has been the purpose to use the many additions to the knowledge of fertilizer manufacture and application, "but in doing so to leave the book itself true to its original concept, and, in so far as may be possible, to have it still the product of one who was himself a pioneer in the field of fertilizer use." Some new matter has been added, and the older matter has been brought up to date.

Fertilizers: Their sources, manufacture, and uses, H. CAVE (*London and New York: Isaac Pitman & Sons [1926], pp. XI+116, pl. 1, figs. 17*).—A general nontechnical account of the sources, manufacture, and uses of fertilizers is presented. The subject is viewed principally from the commercial standpoint. The book contains a general introduction and chapters on mineral phosphates, superphosphate and basic slag, nitrogenous fertilizers, atmospheric nitrogen compounds, potash fertilizers, organic and other products, utilization of fertilizers in agriculture, and commercial information.

World conditions as to mineral raw materials for the fertilizer industry (*Washington, D. C.: Natl. Fert. Assoc., 1926, pp. 180, figs. 7*).—This book contains a series of addresses by specialists from U. S. Government Departments, from the universities, and from the industries on potash, phosphates, sulfur, and nitrogen.

A study of the factors influencing the efficiency of different forms of nitrogen as related to soil type and cropping system in the Atlantic Coastal Plain region, Part I, A. M. SMITH (*Soil Sci., 23 (1927), No. 2, pp. 137–164, fig. 1*).—Two series of fertilizer experiments on surface soil from Snow Hill, Md., are reported from the Maryland Experiment Station, the first constituting a study of the influence of soil moisture on the nitrification rate, the second dealing with the influence of soil temperature on the rate of nitrification. The optimum moisture condition for various nitrogenous materials applied in a 7–6–5 fertilizer to Norfolk sandy loam soil was from 50 to 60 per cent of the water-holding capacity. At 70 per cent of capacity there was more nitrate accumulation from urea than from ammonium sulfate, dried ground fish, or tankage. After the initial rapid nitrification, fluctuations in nitrate nitrogen in this soil appeared to be due to microorganism activity rather than to differences in moisture, temperature, or reaction. Up to 20 to 30° C., nitrate production increased directly with the temperature. At all temperatures urea gave the highest rate, and, at all except the lowest temperature level, ammonium sulfate gave the highest final accumulation of nitrate nitrogen. Considered with respect to both production and accumulation rates, the materials ranked as follows: Sodium nitrate, urea, ammonium sulfaté, dried ground fish, tankage, and activated sewage sludge. Leaching varied with the proportion of the applied nitrogen supplied by sodium nitrate. There was little difference in the nitrate leaching rates from the various materials, save that at first more nitrate was leached from the cylinder receiving urea.

Potassium content of plants as an indicator of available supply in soil, J. W. AMES and R. W. GERDEL (*Soil Sci., 23 (1927), No. 3, pp. 199–216, pls. 4*).—A modification of the seedling method of soil analysis was applied in experiments reported from the Ohio Experiment Station to a study of potassium abstraction in its relation to available supplies of potassium and of other nutrients. Optimum experimental conditions appeared to be obtained with 100 wheat seedlings grown in 200 gm. of soil diluted with 1,000 gm. of sand. Corn and buckwheat seedlings were also used in some experiments.

The potassium removal was found closely related to increased growth produced by adding nutrients. Applications of available potassium stimulated the growth of wheat seedlings. The addition of potassium in fertilizers and manures furnished a potassium residual readily available to wheat seedlings. Potassium abstraction by wheat seedlings from a limed soil fertilized only with acid phosphate for over 30 years did not indicate such a depletion of available potassium as did dilute acid extraction and recently decreasing corn yields. Corn plants grown beyond the seedling stage in undiluted soil varied in potassium content consistently with the available supply.

Losses of added phosphate by leaching from N. Welsh soils, G. W. Robinson and J. O. Jones (*Jour. Agr. Sci.* [*England*], *17* (*1927*), *No. 1, pp. 94–103*).—Experiments are reported which show that under the extremely humid conditions of North Wales and in soils of very low base content phosphate applied to permanent grassland in the form of high-grade basic slag is of fugitive effect. Profile analyses show that after from 6 to 10 years added phosphoric acid has been removed from the surface layers, which have reverted to their original poverty in available phosphorus. It is suggested that the phosphate content of soils may be differentiated into (1) native, stable phosphate and (2) added phosphate which is unstable under North Welsh conditions, being subject to removal by leaching.

Organic matter changes in two soil zones, as influenced by difference in form, fineness, and amount of calcic and magnesic materials, W. H. MacIntire, W. M. Shaw, and E. M. Crawford (*Soil Sci., 23* (*1927*), *No. 2, pp. 107–117, fig. 1*).—Lysimeter experiments at the Tennessee Experiment Station on the effect of various liming materials applied in varying degrees of fineness to both surface and subsurface zones are reported. Organic carbon dioxide was used as a measure of oxidation. The experiments covered the 4-year period from May, 1921, to May, 1925, during which time the soil was not cropped or stirred. The surface zone only of the soil of one series of tanks was treated and the lower zone only of the soil in the other series.

In general the accelerative effects of the liming materials were comparable in the two zones. The final organic carbon dioxide content of the surface zone of the untreated soil was somewhat greater after exposure than that of the original soil, whereas in the subsurface zone the content was decidedly less. This is attributed to surface deposition of soot and to the unavoidable growth of algae and the like on surface soil, together with a possible gravitational readjustment of the soil particles. Loss in the lower zone is attributed to increased bacterial activity, caused by greater moisture and exclusion of sunlight.

Out of 16 treated surface zones, 14 showed less organic matter than the untreated surface zone controls. Out of 16 treated subsurface zones, 15 showed less organic matter than the corresponding subsurface zone controls. No positive differences in organic carbon dioxide residues could be traced to variation in fineness of limestone. Some variation between the coarsest and finest dolomites was observed. The zone influence was apparently greater than that of liming materials with respect to oxidation of organic matter in the soil studied when under fallow conditions, unstirred, and with exposure to natural rain water only.

Outgo of calcium, magnesium, nitrates, and sulfates from high-calcic and high-magnesic limes incorporated in two soil zones, W. H. MacIntire (*Soil Sci., 23* (*1927*), *No. 3, pp. 175–197, figs. 4*).—The results of a 4-year lysimeter study, conducted at the Tennessee Experiment Station, on the losses from a loam soil of calcium, magnesium, calcium-magnesium, nitrate, and

sulfate from additions of calcium hydroxide, burned dolomite, and a lime-magnesia mixture to the surface and subsurface zones at a constant rate of 3,570 lbs. of calcium carbonate per 2,000,000 lbs. of soil are reported.

The loss of calcium from each liming material was in all cases greatest during the first year, decreasing progressively. The magnesium loss from surface-zone treatments with the lime-magnesia mixture was augmented during the first year, but was practically the same as from the controls during the following three years. In the subsurface treatments this loss was increased in all four annual leachings, though greater in the first than in subsequent years. The aggregate leachings of calcium-magnesium from the treated surface zones were comparable for each year and for the 4-year period.

The total calcium-magnesium losses from the subsurface zone were similarly comparable with first year maxima for each of the three liming materials. The annual leachings from the lower zones were about five times as great as those from the upper zone. A slight interchange of calcium for magnesium was found when the excess of calcium salts from the treated surface passed to the untreated lower zone, but "reciprocal repression" took place in the direct leachings from the absorbed calcium excess in the lower zone.

Comparable increases in nitrate and sulfate losses from treatments with calcium oxide and with the lime-magnesia mixture were noted during the first year; but, as there was no marked variation thereafter, the increases for the 4 years were about the same as the corresponding ones for the first year. No marked difference in nitrate losses from the two zones was noted. Even as increased by the treatment, the sulfate losses did not equal the rain water increment. Upper zone leachings carried about twice as much calcium as magnesium, whereas the lower zone treatments gave about twice as much magnesium as calcium. A number of differences in the leachings were noted as between calcium hydroxide and calcium oxide plus magnesium oxide treatments. The progressively decreasing calcium and calcium-magnesium outgo is apparently due rather to diminishing solubility than to diminishing concentration of residuals. Repetition of liming may be needed, not to offset losses, but to supply more freshly absorbed and more soluble lime residues.

Composition and prices of commercial fertilizers in New York in 1926, L. L. Van Slyke (*New York State Sta. Bul. 539 (1926), pp. 21*).—The author concludes that in 1926 the complete fertilizers contained a larger average percentage of plant food than at any previous time recorded. There was a marked increase in the number of fertilizers of high grade as based on total content of plant food, with a relative decrease in the lower grades, and a larger percentage of fertilizers than in previous years was found above the guaranteed analysis, especially as available phosphoric acid and potash. Data with regard to the composition and cost of plant food in such unmixed fertilizer materials as acid phosphate, sodium nitrate, ammonium sulfate, potash salts, bone, tankage, dried blood, dried animal manures, and lime compounds are given.

AGRICULTURAL BOTANY

Dictionary of botany, C. L. Gatin (*Dictionnaire de Botanique. Paris: Paul Lechevalier, 1924, pp. XIX+847, figs. 700*).—In one alphabet are contained botanical terms, from several languages, which are translated into French.

Plant physiology in relation to agronomy, T. J. Harrison (*Sci. Agr., 6 (1926), No. 11, pp. 380–382*).—Illustrations given and claimed to show the value of plant physiology in the explanation of field data point to the necessity of understanding the physiology of the plant in order to interpret correctly the results of field crop experimentation.

A plant photometer, E. S. Johnston (*Plant Physiol., 1 (1926), No. 1, pp. 89, 90*).—Light may influence plant growth by its intensity, its duration, and its quality (wave length), but a study of one of these factors is complicated by the presence of the other two. The present paper describes briefly a method of studying the quality or wave length of light as it affects plant growth in phototropic bending. The apparatus, its use, and its possibilities are very briefly discussed.

A method of growing bacteriologically sterile potato plants, H. G. MacMillan (*U. S. Dept. Agr. Bul. 1465 (1927), pp. 22, pls. 6, figs. 6*).—A description is given of a method by which bacteriologically sterile potato plants grown from vegetative cuttings or tubers may be developed under sterile conditions.

The extraction of plant tissue fluids and their utility in physiological studies, R. Newton, W. R. Brown, and W. M. Martin (*Plant Physiol., 1 (1926), No. 1, pp. 57–65, fig. 1*).—Plant tissues finely ground and gently pressed at temperatures near 0° C. yield a fluid which is believed to have substantially the same composition as the original tissue fluids. Experimental data show the need for careful standardization of the extraction procedure, particularly the pressures employed.

By supplementing ordinary tissue analyses with analyses of the expressed fluids, the distribution of any constituent between the physiologically active and inert portions of the plant may be conveniently determined. The important influence of the physical state of the tissue fluids on their freezing point and the difficulty of proving the identity of the press juice with the actual fluids in the plant are illustrated experimentally.

Some protein properties of plant protoplasm, W. H. Pearsall and J. Ewing (*Brit. Jour. Expt. Biol., 2 (1925), No. 3, pp. 347–356*).—The protein properties or behaviors of plant protoplasm here dealt with include precipitation, chemical combination, changes in volume and in viscosity, heat coagulation, and pH relation. "The result of the comparison would seem to justify the working hypothesis that the properties of the protoplasm can be foretold, to a certain extent, if those of the more important protein constituents are known."

The significance of soil colloids in relation to plant feeding and conservation of essential elements, E. Truog (*Jour. Amer. Soc. Agron., 17 (1925), No. 5, pp. 280–285*).—It appears that colloids influence or control practically all the physical properties of soils, and collectively they must be regarded as a most important soil constituent.

Some phases of the inorganic nutrition of plants in relation to the soil solution, I, II, D. R. Hoagland (*Sci. Agr., 6 (1926), Nos. 5, pp. 141–151, figs. 4; 6, pp. 177–189, figs. 4*).—The first part of this account deals with the growth of plants in artificial culture media and the second with soil solutions as media for plant growth. Details and tabulations are given, and the attempt has been made to outline the results and methods by which scientific understanding of the relation of plant growth to the soil moisture might be obtained.

"Scientific research on soils and plants must place great reliance on the results of experiments conducted in the laboratory or greenhouse." The literature cited comprises 28 titles.

Adjustment of iron supply to requirements of soy bean in solution culture, R. P. Marsh and J. W. Shive (*Bot. Gaz., 79 (1925), No. 1, pp. 1–27, figs. 2*).—In tests of the effects of four soluble iron compounds, used singly, upon the growth and appearance of soy bean plants grown in culture solutions of three types, continuously renewed and constantly aerated, large, healthy, vigorous plants were produced when the iron supply was adjusted from day

to day to meet the requirements, regardless of the type of culture solution or the iron compound employed.

When the available iron supply is slightly excessive the plants may become chlorotic or they may show symptoms of iron toxicity. Healthy green plants show lower dry-weight percentages of iron than do chlorotic plants or plants suffering from iron toxicity. In healthy green plants the iron content appears to be uniformly distributed in the stems and leaves. In the chlorotic plants the iron content is high in stems and low in leaves. In plants suffering from iron toxicity the iron percentage is high in all parts. In order to maintain the plants in the healthy green condition the iron solution must be kept as low as is possible without inducing chlorosis from lack of available iron. A concentration of soluble iron slightly above the optimum may result in iron toxicity throughout the plant, or chlorosis may result from lodgment of iron in the roots and stems. "Small additions of available iron to the culture solution as the plant appears to require it tend to produce equal distribution throughout and to keep it in a healthy green condition. The general appearance of the plant must serve as an index of the iron supply in each case. Definite applications of iron to the culture media at fixed intervals during any given physiological stage of development are not practicable, since the ever-changing plant environment has pronounced influence upon the iron requirement. It appears that a delicate balance exists within the plant which requires that the available iron in the culture medium be limited to a very narrow range of concentrations to produce optimum growth."

The tolerance of plants for NaCl, C. B. Lipman, A. R. Davis, and E. S. West (*Soil Sci., 22 (1926), No. 4, pp. 303–322, figs. 3*).—Studies conducted at the University of California on the effects of a wide range of concentrations of sodium chloride on the growth of wheat, barley, and peas in solution cultures are reported.

All of the plants tested showed a very high resistance to sodium chloride, and under some environmental conditions it was highly stimulating to wheat even at concentrations of 4,000 parts per million or more. It was found that small concentrations of from 500 to 1,000 parts per million may depress growth, particularly in the early stages, but the concentration at which the most marked depression occurred was about 8,000 parts per million. The results are taken to indicate that environmental conditions are a very important determinant of the kind of results which can be obtained.

The selective absorption of chlorine ions, and the absorption of water by the leaves in the genus Atriplex, J. G. Wood (*Aust. Jour. Expt. Biol. and Med. Sci., 2 (1925), No. 1, pp. 45–56, fig. 1; abs. in Nature [London], 116 (1925), No. 2905, p. 27*).—The more rapid absorption of water in the case of characteristically desert plants (*Atriplex* spp.) is thought to be due measurably to the high osmotic pressure in the tissues of these plants. "Extensive absorption of water does not occur at all times through the roots, and the success of the plant in these regions must be attributed to its ability to absorb water rapidly through its leaves."

Chlorophyll defect in barley [trans. title], L. Honecker (*Ztschr. Pflanzenzücht, 10 (1925), No. 2, pp. 172, 173*).—A paling or chlorosis of barley, which began to show (in part of the progeny of a crossing indicated) about May 3 and to prove fatal about May 12, affected the plantlets in the ratio of approximately one chlorotic to three normal individuals.

Plant nutrition research (*Wisconsin Sta. Bul. 388 (1926), pp. 123, 124*).—In a previous publication (E. S. R., 55, p. 520) W. E. Tottingham et al. showed the response of sugar beets to light and temperature. Continued

investigations indicate that sugar beets in strong light stored the largest amount of sugar and protein at a relatively low temperature, or in the cool, fair weather of autumn, but this was not true of corn. It appears that the amount of soluble protein in the leaf is one of the factors determining the response of the leaf to light and temperature. Observations which have continued for two years on the chemical composition of crops grown at the main station and the Ashland Substation are said to indicate that the clovers grown at Madison have a higher protein content than those grown at Ashland. Some differences have also been noted between corn, oats, and barley grown at the two stations.

The development of sugar beets during the second year, with reference to the distribution of sugar, dry matter, ash, and marc [trans. title], V. Stehlík (*Listy Cukrovar., 44 (1925–26), pp. 17– ; trans. in Ztschr. Zuckerindus. Čechoslovak. Repub., 50 (1926), Nos. 35, pp. 295–300, figs. 4; 36, pp. 301–308, figs. 4; 37, pp. 309–315, fig. 1*).—Continuing a previous account (E. S. R., 53, p. 24), which dealt principally with the first year of growth of the sugar beet, work is here recorded as done in four parts, dealing, respectively, with development in quartered beets under glass in poor soil with reference to the distribution of materials, development of entire beets in poor soil under glass, development of entire beets in the field and distribution of materials during the whole development, and development in beet sets.

Both composition and distribution of materials depend upon the growth of the plants individually. Particulars are given in comparison with developments during the first year. The distribution of marc (pulp) corresponds to the anatomical structure, depending more strictly in this respect upon the vascular bundle material. Raw-fiber content corresponds on the one hand to the degree of development and on the other to anatomical structure in a given part. The distribution of dry-substance content depends upon the distribution of other materials. In the first year of growth this dependence is more important to the sugar refiners and in the second year to beet breeders and seed raisers.

The influence of the time of threshing upon the germinability of grain [trans. title], A. Morettini (*Staz. Sper. Agr. Ital., 58 (1925), No. 1–6, pp. 161–182*).—Threshing injury to grains did not seriously impair germinability for seeding purposes.

Catalase activity and the aerobic and anaerobic germination of rice, T. Morinaga (*Bot. Gaz., 79 (1925), No. 1, pp. 73–84*).—The work here reported was undertaken to throw light on the relation of catalase to the dynamic cell processes.

The amount of catalase in dry rice seeds is only about one-tenth as great as in wheat, barley, oats, or rye. Rice germinating aerobically contains about seven-tenths as much as does germinating wheat, barley, or oats. In anaerobic germination catalase does not increase, but in a medium having a reduced amount of oxygen catalase increases slowly. Catalase activity increase appears to be a function of the free oxygen present in the medium. Free oxygen affects directly or indirectly the development of plumule and radicle and also that of the chlorophyll. The catalase once increased by aerobic conditions decreases during anaerobiosis, while growth of the plant continues. Aerobically grown seedlings with high catalase use much more oxygen than do anaerobically grown seedlings with low catalase activity. The anaerobic seedlings, however, give off a comparatively large amount of carbon dioxide during respiration, whether under normal aerobic or under anaerobic conditions.

The hydrostatic system of trees, D. T. MacDougal (*Carnegie Inst. Wash.*

major sap movements in large trees must rest upon a good grasp of hydrostatic conditions, the author has, in the present monograph, included results upon which certain phases of sap pressure are explained, without, however, accounting for all root pressures. A unified conception of the large leafy plant as a hydrostatic system has been attempted in a paper previously noted (E. S. R., 56, p. 218).

Some important modifications based upon results set forth in the present paper are proposed. "The principal advances concern the body of gas in the older wood; the capillary extension of the water column in this wood; the strictness of conduction of solutions in the outer layers; or, more briefly stated, the localization of mechanical factors and of the physiological action affecting movements of solutions." The data and conclusions from the numerous phases of the present study are summarized in some detail.

Symbiosis in a deciduous forest, II, W. B. McDougall (*Bot. Gaz.*, *79* (*1925*), *No. 1*, *pp. 95–102*, *fig. 1*).—It is the purpose of the present installment of this series (E. S. R., 49, p. 523) to discuss a few recently studied examples of nutritive disjunctive symbiosis and their effects on the vegetation in the woods previously indicated, which were formerly much grazed by cattle with the result of suppressing certain species and of favoring others. The parts played by some other animals were also studied and are indicated.

The nutrition of mycorrhiza plants: Calluna vulgaris, M. C. Rayner (*Brit. Jour. Expt. Biol.*, *2* (*1925*), *No. 2*, *pp. 265–292*, *pls. 3*, *figs. 5*).—In an observation of the formation and seasonal development of mycorrhiza in *C. vulgaris*, digestion of the intracellular complex of mycelium was noted, and this is reported, supposedly for the first time. The cytology of the process is described. Knowledge of the distribution of the endophyte has been extended, and this has been confirmed by recovery and identification of the endophyte.

It is claimed that Calluna is associated with infection and seedling development and not with mycorrhiza formation and growth. The view is expressed that plants would probably grow quite well without mycorrhiza if seedlings could be raised without infection. The evidence for exchange of nutritive material is stated and examined, and the view has been reached that such exchange exists, with a balance of profit on the side of the vascular plant.

Some observations on the growth of yeast, E. I. Fulmer (*Plant Physiol.*, *1* (*1926*), *No. 1*, *pp. 67–76*, *figs. 4*).—The author attempts to formulate and illustrate certain general principles and their several corollaries with reference to the study of the growth of organisms, as instanced by the behavior of yeast, reproduction being a criterion here employed.

The relative potencies of two materials as they affect the growth of a microorganism can not be ascertained by the comparison of the effect of equal weights or concentrations of materials. Such relation of potencies may not hold equally at different temperatures, so that such terms as optimum temperature, thermal death point, and temperature coefficient of growth have no general meaning but are, in fact, functions not only of the components of the medium but also of their concentrations.

Two materials can not be compared as a source of a protoplasmic constituent on the basis of their effect as regards growth rate of a microorganism unless secondary effects are compensated in a series. Comparisons of two materials as affecting the growth of microorganisms at one growth phase may not apply in case of any other growth phase. Results obtained by means of one criterion of toxicity are not necessarily applicable to any other criterion.

Violent spore-discharge in Tilletia tritici, A. H. R. Buller and T. C. Vanterpool (*Nature* [*London*], *116* (*1925*), *No. 2930*, *pp. 934*, *935*, *fig. 1*).—Studies

briefly recounted are considered as confirmatory of the view that the Tilletiaceae belong to the Basidiomycetes, also as showing that the so-called secondary conidia of *T. tritici* and *Tilletia* spp. are in reality the true basidiospores, and that the sporidia or primary conidia of O. Brefeld and others are morphologically equivalent to sterigmata. It is thought that further research will show that the authors' new conception of the basidium in the genus Tilletia may be successfully applied to the basidia of the other genera of the Tilletiaceae.

Heterothallism in the genus Penicillium—A preliminary note, H. G. DERX (*Brit. Mycol. Soc. Trans., 11 (1926), pt. 1–2, pp. 108–112*).—"*P. luteum* . . . furnishes the first example of heterothallism in this common genus."

GENETICS

The problem of the origin of species as it appeared to Darwin in 1859 and as it appears to us to-day, H. F. OSBORN (*Science, 64 (1926), No. 1658, pp. 337–341*).—The author points out that considerable knowledge of the mode of the development of species has been acquired, but that little is known of the causes of the variations responsible for the origin of new species.

The problem of cell division from the physiological point of view, A. and L. GURWITSCH (*Das Problem der Zellteilung Physiologisch Betrachtet. Berlin: Julius Springer, 1926, pp. VII+221, figs. 74*).—Cell division is technically discussed under three main headings, the beginning of cell division, cell division as a factor in evolution, and the course of mitosis.

Chromosome and gene mutations in Datura following exposure to radium rays, C. S. GAGER and A. F. BLAKESLEE (*Natl. Acad. Sci. Proc., 13 (1927), No. 2, pp. 75–79*).—The effect of treatment of buds of *D. stramonium* with radium emanation was studied at the Brooklyn Botanic Garden as an outgrowth of early studies (E. S. R., 20, p. 929). In the offspring of a single capsule were obtained 17.7 per cent chromosomal mutants (chiefly nondisjunctional forms), a much higher percentage than ever obtained from untreated capsules, the average for over 15,000 offspring being 0.47 per cent; a new compound chromosomal type, Nubbin; and two new gene mutants out of 18 individuals tested. The authors believe that the radium treatment may be held largely responsible for most, if not for all, of these three types of results.

The chromosomal constitution of Nubbin, a compound (2n+1) type in Datura, A. F. BLAKESLEE (*Natl. Acad. Sci. Proc., 13 (1927), No. 2, pp. 79–85, figs. 4*).—This contribution from the Carnegie Institution is concerned with "Nubbin," a new compound chromosomal type, whose origin is indicated above.

Chromosome behavior in the heterotypic division in Oenothera lamarckiana and some of its mutants and hybrids [trans. title], A. HÅKANSSON (*Hereditas, 8 (1927), No. 3, pp. 255–304, pl. 1, figs. 5; Eng. abs. pp. 300–302*).—This is a contribution from the Botanical Institute at Lund, Sweden.

The chromosomes of rodents, T. S. PAINTER (*Science, 64 (1926), No. 1657, p. 336, figs. 5*).—The author briefly presents the results of studies by graduate students at the University of Texas of the chromosomes of the house mouse, the albino rat, and the guinea pig.

E. Cox found in numerous counts that the diploid number for the male mouse was 40, with 20 as the haploid number. The sex chromosomes were of the X-Y type, and in the first maturation division the X and Y appeared at first to be joined but later segregated to opposite poles. I. Kehoe found the spermatogonia of albino rats to contain 42 chromosomes. This number was further confirmed in studies of the amnion of a number of male and female embryos. B. League found the diploid chromosome number of guinea pigs to be between 60

and 64, while the haploid number was 30. No sex chromosomes were identified. It is of special interest that the chromosome number is lower in prophases of spermatogonia than in the equatorial plate stages. The chromosome number of the rabbit has been found in earlier studies to be 44.

Symbols for mutations in mice, W. H. GATES (*Science, 64 (1926), No. 1657, p. 328*).—Symbols are given as recommended by the Mouse Club for the mutations in mice.

The proportion of exceptions in the offspring of exceptional females from X-ray treatment of Drosophila, E. G. ANDERSON (*Mich. Acad. Sci., Arts, and Letters, Papers, 5 (1925), pp. 355–365*).—The progeny of 46 nondisjunctional noncross-over and 19 nondisjunctional cross-over flies were classified as to the regular and exceptional young produced. All but 2, which were cross-over flies, gave the expected percentage of exceptions, approximately 4 per cent. The 2 showed high percentages of exceptional offspring, being 27 per cent for one and 14.1 per cent for the other.

Crop and stock improvement, A. B. BRUCE and H. HUNTER (*London: Ernest Benn, 1926, pp. 119*).—This manual endéavors to explain in simple language and to illustrate the principles of crop plant and animal improvement.

Experiments on the genetics of wild populations—Part I, Grasses, J. W. GREGOR and F. W. SANSOME (*Jour. Genetics, 17 (1927), No. 3, pp. 349–364, figs. 10*).—Experiments with *Lolium perenne*, *Dactylis glomerata*, and *Phleum* spp. at Corstorphine, Edinburgh, by the Scottish Society for Research in Plant Breeding suggested that definite hereditary habitat types exist within the grass species. The habitat type appears to represent the genotypical response of the species population to a definite habitat. Habitat types did not necessarily arise through chance isolation of variations or by a gradual change from one type to another without selection of individuals. The phenotypic uniformity and incomplete genotypic similarity in the coastal population of perennial ryegrass indicated that phenotype selection and genotype selection have been in progress. The reaction of the plants to environment and the occurrence of prostrate forms in the several species is commented on.

On a progressive variation with age of a simple Mendelian ratio in the cowpea, S. C. HARLAND, J. C. HAIGH, and J. L. LOCHRIE (*Genetica [The Hague], 8 (1926), No. 5, pp. 507–512, fig. 1*).—To see whether the segregation ratio varied with age of plant, studies were made on F_2 families derived from two plants, in constitution *XX* and *xx*, respectively. The factor *X* in the cowpea manifests itself by production of anthocyanin pigmentation in the leaf axil and at the junction of the pinnae with the petiole. The plant body is colorless in absence of this factor.

The results showed that in F_2 cultures from successive days of flowering an orderly variation occurs in the simple Mendelian 3:1 ratio, an excess of recessives in the first nine days being compensated for by an excess of dominants as the plants grow older. There is some indication also that as the plants are completing their first flowering period an excess of recessives again occurs.

The question of spring and winter types in wheat [trans. title], G. NILSSON-LEISSNER (*Hereditas, 8 (1927), No. 3, pp. 339–350*).—Further observations are recorded on the material described earlier (E. S. R., 55, p. 127), special reference being made to segregation for spring and winter habit.

Colour heredity in horses, H. B. STIRLING (*Scot. Jour. Agr., 8 (1925), No. 1, pp. 32–39, pls. 2*).—An account is given of the inheritance of color in the horses of a privately owned stud, all of which descended from a single gray mare purchased in 1878. The mares were repeatedly mated to brown and black

Clydesdale stallions. It is shown that the colors segregated out in succeeding generations, but in no cases were grays produced except from a gray parent. There appeared to be no connection between gray and roan, as each seemed to be a distinct color.

Inheritance of black in swine, B. L. WARWICK (*Jour. Heredity, 17 (1926), No. 7, pp. 251–255, figs. 2*).—The 125 F_1 progeny of matings between a Duroc-Jersey boar and Poland-China sows at the Wisconsin Experiment Station were all black spotted with the body color varying from almost white through sandy to red. Of the 138 F_2 offspring produced, 107 had one or more black spots, while black was absent in 31. Further tests of F_1 and F_2 sows by back crossing them with the Duroc-Jersey boar also indicated that the presence or absence of black was due to the action of a single pair of factors. The amount of black appeared to be governed by multiple factors.

Inbreeding versus "accumulation of blood": Defense of the genetical concept of inbreeding attacked by Baashuus-Jessen, H. J. MULLER (*Jour. Heredity, 17 (1926), No. 7, pp. 240–242*).—A critical review of the article by Baashuus-Jessen previously noted (E. S. R., 55, p. 525), in which it is stated that the means suggested for measuring inbreeding is based merely on the accumulation of blood of a single parent.

Age and quality of offspring: The effect of age of parents on the quality of offspring in cattle, A. C. CHAUDHURI (*Jour. Heredity, 17 (1926), No. 10, pp. 368–370*).—In studies at the animal breeding research department of the University of Edinburgh, the first five winners in the classes of over 20 of the Highland and Agricultural Society's shows were classified as to the age of the parents on a point basis, and compared on the basis of the number of cows calving at each age as selected from volumes 58 to 70 of Coates' Herd Book. The author concludes from the study that though the number of points per cow shows a possible slight but irregular increase with the age of the dam, this can not be considered as significant, since cows are more likely to be kept to an advanced age in the herd when they have produced offspring above the average. The greatest number of prize winners were produced by sires which were 2 years old when the winners were born, probably due to the practice of a majority of breeders of using young bulls.

A contribution toward the analysis of the influence of the age of parents upon their offspring: The age of ewes and the rate of growth of their lambs [trans. title], R. PRAWOCHEŃSKI and B. KACZKOWSKI (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Pulawach (Mém. Inst. Natl. Polon, Écon. Rurale Pulawy), 7 (1926), A, pp. 139–157 figs. 2; Eng. abs., pp. 156, 157*).—Studies of the birth weights and growth of lambs produced by young ewes and old ewes, both of which were mated to the same ram, indicated that the birth weight of the offspring of young ewes was much less than that of older ones, and that the rate of growth of the lambs during suckling was also greater for the lambs produced by the older group. As soon as the lambs began to consume pasture those produced by the younger ewes grew more rapidly and soon overtook the lambs produced by the older ewes. Several breeds of lambs were used in the study, including Southdown, Świnarka czarna, Świnarka biała, Podhalański, and crossbreeds.

Increased efficacy of subcutaneous when compared with intraperitoneal administration of the ovarian hormone, H. M. EVANS and G. O. BURR (*Amer. Jour. Physiol., 77 (1926), No. 3, pp. 518–521*).—Tests made at the University of California have shown that the minimum dose of the ovarian hormone, necessary to cause the presence of cornified epithelial cells of the vaginal smear of spayed rats, was considerably less when the doses were divided into four parts and

administered on four successive days than when the complete dose was given at one administration. Considerably less of the hormone was required to cause oestrus when administered subcutaneously than when administered intraperitoneally.

The determination of sex, R. T. HANCE (*Sci. Mo., 24 (1927), No. 1, pp. 25–30, fig. 1*).—The physiological and physical hypotheses of sex determination are reviewed. The followers of the latter hypothesis believe that the chromosome complex is the cause and the physiological changes the effect, while the followers of the former hypothesis hold the opposite view. The chromosome theory is considered by the author as better established than the physiological theory.

FIELD CROPS

The relations between crop yields and precipitation in the Great Plains area, E. C. CHILCOTT (*U. S. Dept. Agr., Misc. Circ. 81 (1927), pp. 94, figs. 67*).—In an endeavor to determine their relations, crop yields and precipitation (also evaporation) data obtained during 20 years on 23 field stations in the Great Plains area under natural field conditions over a broad range of soils, climate, tillage, methods, and crop sequences and equivalent to 303 years of practical farming are made available, portrayed graphically, and discussed in detailed and summary form. The hazards, advantages, and prospects of agriculture in the region are briefly described.

Although annual precipitation is a vital factor in determining crop yield, it appears to be seldom if ever the dominant factor. Not only the seasonal and monthly but also the daily distribution of the precipitation may be much more important than its annual magnitude. The limitation of crop yield is often due to the operation of one or more inhibiting factors other than shortage of rainfall.

Yields equivalent to 10 bu. or less per acre of wheat have occurred in 75 of 218 crop years during which these investigations were made at 16 stations on the northern Great Plains. During 23 of the 75 years the annual precipitation was less than 12 in. During 52 of the 75 crop years the low yields were due to inhibiting factors other than inadequate annual precipitation. Nevertheless, the composite crop yields averaged throughout the 218 crop years the equivalent of 16.1 bu. of wheat per acre.

The mean annual precipitation of the Great Plains as represented by the 23 dry-land field stations is sufficient to produce crops equivalent to those obtained at the 16 stations if the inhibiting factors are no more potent than they have been during the period covered by these investigations. "With respect to climatic conditions, no extensive portion of the Great Plains as represented by these field stations is markedly superior or inferior to any other portion."

The effect of different climatic conditions on pure lines of oats and barley [trans. title], W. CHRISTIE and H. H. GRAN (*Hereditas, 8 (1926), No. 1–2, pp. 207–228, figs. 5*).—The study reported on is concerned with the reactions of two lines of barley and seven of oats to culture under the varied environmental conditions of six localities in Norway, as shown by germination, production, length and diameter of culms, tillering, and ripening.

Plant breeding, W. E. BRYAN and E. H. PRESSLEY (*Arizona Sta. Rpt. 1925, pp. 493–497, figs. 2*).—High uniformity was observed among first and second seed generation progenies from hairy Peruvian alfalfa (E. S. R., 53, p. 734). Considerable difference existed between progenies in regard to hay value, some being fine stemmed and leafy and others having coarse stems with scant

foliage. There seemed to be a tendency to light seed production in the leafy progenies and to heavy seed production in the nonleafy progenies.

Blooming and shedding studies revealed averages of 67 per cent of shedding in Acala cotton, 71 in Lone Star, and 80 per cent in Hartsville. Acala exhibited the widest range in shedding percentage.

Milling and baking tests with several pedigreed wheats showed some of the Arizona flours to compare very favorably with Kansas patent flour in absorption, loaf volume, bread color, and texture.

[Agronomic work in Arizona, 1923], G. E. THOMPSON, R. S. HAWKINS, and S. P. CLARK (*Arizona Sta. Rpt. 1923, pp. 451–463, 485–487, figs. 2*).—Continued experiments (E. S. R., 53, p. 733) reported on included variety tests with cotton, corn, wheat, barley, oats, grain sorghums, sorgo, sweet potatoes, and miscellaneous legumes and forage crops; fertilizer trials with cotton and wheat; a source of seed test with potatoes; and pruning and spacing tests with sweet potatoes. Outstanding results on the Prescott, Sulphur Spring Valley, Yuma, and Salt River farms are summarized.

[Field crops experiments at the South Mississippi Substation], E. B. FERRIS and W. S. ANDERSON (*Mississippi Sta. Bul. 238 (1926), pp. 3–6, 8–10, 11, 12, 16, 17*).—Continued investigations (E. S. R., 55, p. 228) reported on embraced variety tests with corn; fertilizer tests with corn, oats, sweet potatoes, and tobacco; trials of winter cover crops, lespedeza, and certified seed potatoes; and breeding work with sweet potatoes. Acre yields of seed cotton obtained after peas averaged 1,205 lbs., soy beans 1,125, velvet beans 1,170, corn 1,015, corn and peas 1,190, corn and soy beans 1,185, and corn and velvet beans 1,195 lbs. Indiscriminate winter grazing of velvet beans seemed a probable cause of injury to land rather than velvet bean culture itself.

[Field crops work at the Holly Springs, Miss., Substation], C. T. AMES (*Mississippi Sta. Bul. 239 (1926), pp. 28, figs. 9*).—Continued experiments (E. S. R., 53, p. 131) reported on embraced variety trials with cotton on hill and valley land, corn, and soy beans; fertilizer tests with cotton and corn; spacing trials with cotton and sweet potatoes; and an interplanting trial of corn with velvet beans and soy beans. Methods for growing these crops, sorgo for silage, vetch, and lespedeza are outlined, and the advantages of dairying in the region are cited briefly.

From 1921 to 1926, inclusive, Lone Star 65 and Delfos 6102 and 631 have been outstanding on both hill and valley land, although other sorts also had merit. Spacing trials suggested from 2 to 3 stalks per foot in 3.5-ft. rows on valley land and 3 to 4 stalks per foot in 3-ft. rows on hill land. Fertilizer experiments have shown deficiency in phosphorus and nitrogen and perhaps to some extent potassium. From 400 to 600 lbs. per acre of an 8–4–4 fertilizer or of a mixture of acid phosphate 200 lbs., sodium nitrate 100 lbs., and potassium sulfate or chloride 25 lbs. or kainit 100 lbs. is advised for cotton.

[Field crops experiments at the Raymond, Miss., Substation, 1926], H. F. WALLACE (*Mississippi Sta. Bul. 240 (1926), pp. 3–11*).—Tests during several years (E. S. R., 55, p. 228) indicate Trice (Mississippi Station), Willis, Miller, D. & P. L. No. 4, Cleveland 54, and Acala cotton for hill land and Delfos 631 and 6102, Lone Star 65, Trice, and D. & P. L. No. 6 for valley land. From 500 to 600 lbs. per acre of 8–6–4 fertilizer is indicated, with modifications for certain conditions. Several nitrogen sources gave substantial increases over no nitrogen. Spacing recommendations are 2 to 3 stalks per foot in 3.5-ft. rows on valley land and 3 to 5 stalks per foot in bunches in 3-ft. rows on hill land.

Laguna, selections of Cocke and Whatley Prolific, and Mexican June led the corn varieties over a period. Fertilizer trials suggested an acre application of a mixture including acid phosphate 100 lbs., sodium nitrate 150 lbs., and kainit 50 lbs. Sodium nitrate and calcium nitrate led the nitrogen sources in increases. A variety test with soy beans is reported briefly.

[Field crops investigations in Wisconsin, 1924–1926] (*Wisconsin Sta. Bul. 388 (1926), pp. 26–39, 41, 47–50, 126, 127, figs. 6*).—The continuation of earlier experiments (E. S. R., 53, p. 432) is reported on.

L. F. Graber observed that lack of snow and presence of ice sheets have been the most general causes of recent winterkilling of alfalfa. A thin straw mulch applied for winter protection has been found valuable for alfalfa cut late in the fall or seeded late in summer. Alfalfa appeared to be in no danger of smothering itself due to heavy fall growth. Blue grass and timothy in alfalfa cut twice a year, similarly to the alfalfa, made much better growth than when in alfalfa cut three times annually, although the percentage of grass was higher in the hay from the latter plats. Timothy and alfalfa yields were higher in all plats cut in the full bloom stage and only twice a year. Early and frequent cutting evidently reduced the vigor of alfalfa and of pasture and hay grasses as well. Recent trials showed that such cutting delays recovery of alfalfa, whereas even one late and mature cutting aids it greatly.

Alfalfa has been seeded successfully just prior to the last cultivation of corn in southern Wisconsin. Alfalfa or sweet clover gave excellent results when seeded with oats and the oats pastured off by cows. Late summer seedings could not withstand unfavorable winters unless covered with straw. Timothy and bluegrass grew better with alfalfa than when seeded alone. Sweet clover seeded on bluegrass sod burned before the frost left the ground made a much better stand than on unburned sod. Its use to rejuvenate old bluegrass pasture is suggested.

In tests with supplementary pastures and hay crops G. B. Mortimer found that Sudan grass seeded in May and June would give considerable grazing for dairy cows in the summer. Peas, 2.5 bu., and oats, 1.5 bu., gave the highest cured hay yields of their combinations, and Sudan grass and soy beans produced their best results at respective rates of 10 lbs. and 1.5 bu. Soy beans sown alone for hay on weedy land required heavy seeding.

The date of seeding influenced both root and top development of wheat and consequently had a bearing upon winterkilling, according to results of a study by G. Janssen. The most resistant plants were developed by seeding in the last half of September. It appeared that those plants which actively stored plant food well into the fall and lost reserve substances rather slowly during the rest of the period survived the winter best and resumed growth earlier in the spring. Late fall plantings suffered most from root fracturing and consequent drying out. Less winterkilling resulted on soil with a low moisture content. High osmotic pressure in plants was correlated with hardiness in the 1922–23 crop but had little or no relation the next year. Very little fluctuation was apparent in the total nitrogen in the wheat plant during the fall and winter dormant season. The soluble and protein nitrogen seemed to increase with a lowering of temperature. However, the protein nitrogen dropped rapidly after the freezing point of the plant. Hexose and hexosan (sugar) compounds did not appear to be the direct factors causing hardiness. The optimum seeding rates for oats and winter wheats are indicated.

In a 4-year test by H. W. Albertz little seemed to be gained by planting soy beans in corn when soil and climatic conditions are optimum for corn. If conditions favor soy beans but not corn the combination outyields corn alone.

When conditions favored corn the soy beans made an early rapid growth, but as soon as the corn shaded them they tended to become slender and to lose their lower leaves in dry seasons. On fertile soil in warm summers with plentiful rainfall throughout the growing season the combination produces more silage but less ears. A. L. Stone reported that growing Wisconsin strains of corn such as Wisconsin Nos. 7, 8, 12, and 25 in States with a somewhat milder climate tends to distinctly prolong the maturing period such that the use of such corn for seed is not advised where ripe grain is desired.

Brief accounts of the status of hemp and flax production in the State are presented by A. H. Wright. His tests showed that for the best combination of quality and yield in hemp, cutting can safely begin when the pollen is readily observable. Experiments on five marsh soil areas indicated that, regardless of the fertilizer application, hemp can not be satisfactorily grown on marshes until the excess of available nitrogen has been reduced. Marshes poor in available nitrogen have grown satisfactory hemp with commercial fertilizers, yields of 1,600 to 1,800 lbs. per acre being obtained by the use of 400 lbs. of 0–8–24 (N–P–K) fertilizer. It is believed, however, that most marsh soils will not produce a suitable quality of hemp fiber. Complete fertilizer, such as 5–8–7 or 4–8–6, has been most satisfactory on the mineral soils growing hemp. Barnyard manure has given good results and can be supplemented by commercial fertilizers under certain conditions.

Extensive studies (E. S. R., 55, p. 829) demonstrated that while flax can be grown with any small grain, wheat is most satisfactory and oats reasonably so, while barley usually matures too early for the flax. About equal quantities by weight of flax and wheat or oats give best results, whereas the flax-barley seed mixture should be about one- and two-thirds, respectively, by weight. On weed-free soil flax alone did better than a flax-cereal mixture, but with weedy land flax-wheat mixtures seemed to excel. Difficulty in separating the flax and grain after the grain is threshed is an important factor with oats and barley. Flax and small grains grown together yielded about the same as when the different crops were grown alone. Flax-oats and flax-barley mixtures were not satisfactory from the viewpoint of feeding.

Mixtures of small grains, such as wheat and oats, barley and oats, or wheat, oats, and barley, again indicated distinct advantages over growing the grains separately. The crops mixed gave higher yields than when grown alone in five years' work, indicating that an increased relative yield of 15 to 20 per cent may be expected from the combinations.

Neither a liquid herbicide nor a similar solution of sodium arsenite destroyed weeds satisfactorily in tests by Stone.

A new root rot-resistant strain of tobacco, Havana 142, developed in cooperation with the U. S. Department of Agriculture, is indicated for old tobacco soils where root rot is generally present; the strain grows upright and has many leaves per plant. Fertilizer trials by J. Johnson suggest from 500 to 1,000 lbs. of a 2–12–4 formula with the potassium as sulfate. When applied in the row by a fertilizer attachment at planting, about 250 lbs. per acre should be used. The best system for tobacco in Wisconsin seems to be to grow tobacco continuously on the same land after a satisfactory field has been found.

Studies by F. V. Owen indicate that mottling in soy beans often may be caused by environmental conditions. Seed free from mottling is ordinarily obtained when the plants are grown in thick stands in fertile soil. Different strains exhibited marked differences in their tendency toward mottling. "The investigation shows that yellow and green beans have a factor for the production of pigment and that it is only because of a restriction factor that we can ever

have pure yellow or green soy beans, and while the presence of this restriction factor can sometimes be explained on a simple Mendelian basis, in other cases it is clearly evident that other genetic factors are also involved."

[Inoculation of legumes in Wisconsin] (*Wisconsin Sta. Bul. 388 (1926), pp. 85–90, figs. 2*).—Much work along this line has been summarized (E. S. R., 56, p. 526).

In inoculation experiments by A. L. Whiting with canning beans appreciable increases resulted in the number of pods and in the nitrogen content of the soil. Nodules were abundant on all roots in sand, whereas practically none were found in silt during the growing season. The spread of bean diseases through wetting and mixing the seeds, as required by inoculation, occurred only with some lots of seed of only one variety. Nodule production on the beans showed a relationship to the nitrate content but apparently none to variety, soil acidity, or soil type. Moisture conditions seemed to have greatly influenced the root development of beans as well as their growth.

Red and alsike clovers made a decided response to inoculation in stands and growth. Growth differences were also shown by *Dalea alopecuroides*. Bacteria with free access to air grew much better than those in stoppered bottles. Field observations revealed very serious injury to the seed and a reduction of nodule production on soy beans caused by the application of 200 and 400 lbs. of ammonium sulfate, potassium chloride, monocalcium phosphate, and calcium chloride, whereas calcium carbonate and tricalcium phosphate resulted in increased growth and abundant nodule production.

A study of the root-nodule bacteria of Wood's clover (Dalea alopecuroides), A. L. WHITING, E. B. FRED, and G. E. HELZ (*Soil Sci., 22 (1926), No. 6, pp. 467–475, figs. 3*).—Experiments at the Wisconsin Experiment Station showed that Wood clover (*D. alopecuroides*) does not possess root nodule bacteria in common with any other legume group. As a consequence it is grouped alone for inoculation purposes. The nitrogen content of this annual legume was found very high and to compare favorably with other legumes. The root nodule organism of Wood clover produces in milk a serum zone characteristic of the bacilli group. The organism is motile, and its flagella are peritrichous.

Alfalfa investigation, T. A. KIESSELBACH and A. ANDERSON (*Nebraska Sta. Research Bul. 36 (1926), pp. 125, figs. 27*).—The investigations reported were made to determine the relation of variety, source of seed, and cultural practice to the yield and quality of alfalfa hay produced. Extensive reviews deal with other work on varieties and regional strains, maturity stages, and curing practices, a total of 137 titles being cited.

The merits of varieties and strains have been noted (E. S. R., 54, p. 32). Variation in flower color of the variegated sorts was the most obvious physical difference between varieties. Root and crown measurements of several sorts did not show differences enough for varietal classification.

Variations between cuttings were more striking than varietal or strain differences. The average yields of seven varieties declined from the first to fourth cuttings, and the leaf percentage and protein content increased from the first to third and stem diameter and plant height decreased. Tillage of established stands of alfalfa with different types of harrows did not increase yields, and the most intensive treatment caused some reduction. During 5 years there was a 30 per cent reduction in the stand on untilled plats and 43 per cent on plats disked and spring-tooth harrowed. No relation was apparent between tillage and plant development as measured by root diameter.

During 4 years alfalfa harvested at the prebloom, initial bloom, one-tenth bloom, half-bloom, full-bloom, seed, and new growth stages yielded 3, 3.03,

3.35, 3.42, 3.19, 2.82, and 3.51 tons per acre, respectively, and the proportion of leaves at harvest was 57.3, 56.6, 55.8, 53.2, 49.4, 33.3, and 52.8 per cent. Measurable seed production from seed plats occurred in only one year. Harvesting alfalfa in relatively immature stages tended to thin the stand and retard root development. The protein and ash content of the hay gradually decreased from the prebloom stage to the full-bloom stage, and crude fiber increased. The slight variation in N-free extract and fat does not appear associated with maturity. The stems of alfalfa hay harvested at six (omitting the seed stage) stages contained 75, 43, 249, 91, and 46 per cent as much ash, protein, crude fiber, N-free extract, and fat, respectively, as the leaves. The stem: leaf ratio in protein content remained practically constant regardless of maturity. Of the total protein in the hay, that in the leaves ranged from 75 per cent in the least mature to 70 in the ripest stages. The first, second, and third cuttings of the six maturity stages consisted of 48.7, 56.4, and 58.1 per cent of leaves and of 18.96, 19.83, and 20.03 per cent of protein. Considering acre yield of hay and feed constituents, hay quality, and permanency of stand, harvesting alfalfa at about the new growth stage should probably prove most desirable. With normal blooming conditions, this usually falls between the tenth and half-bloom stages.

Gypsum, sulfur, lime and sulfur, or lime applied as top-dressing to established alfalfa failed to increase the yield, while manure applied every 4 years produced 13 per cent increase. Alfalfa and timothy seeded in combination did not materially outyield alfalfa alone. Seeding experiments indicated that seeding practices should be adapted to local conditions. Inoculation appeared seldom necessary in Nebraska, but it is recommended where repeated failures to obtain stands have been experienced. The maintenance of alfalfa stands and the behavior and subsequent effects of the crop in rotations are discussed briefly.

Curing studies demonstrated that windrowing and cocking relatively green alfalfa hay materially extended the curing period as compared with swath curing. Prolonged swath curing resulted in undue loss of leaves and bleaching. Judicious partial swath curing to hasten the rate of drying followed by windrowing before the leaves shatter appeared to be the best farm practice for the region. The normal transpiratory function of the leaves of cut alfalfa was found to be a negligible factor in the curing process. Normal hay with leaves dried somewhat faster than the bare stems, but when the curing of the stems and leaves were averaged the rates were similar. A close relation was observed between weather conditions and curing rate. Drying of external moisture has a similar relation to weather conditions and method of curing as that of internal moisture but usually takes place more rapidly.

Differences in resistance to low temperatures shown by clover varieties, G. Steinbauer (*Plant Physiol., 1 (1926), No. 3, pp. 281–286, figs. 2*).—Investigation at the Minnesota Experiment Station demonstrated that the viability of red clover seeds with a moisture content of less than 15 per cent of the dry weight is not affected by temperatures as low as −48° C. (−54.4° F.) for short periods, whereas in seeds with high moisture content germination is greatly impaired by low temperatures, declining very rapidly in seeds containing above 25 to 30 per cent of moisture. Plants of the same clover variety varied with age in respect to killing temperatures, susceptibility to injury being most pronounced when about 3 weeks old or at the time of the formation of the first pair of permanent leaves. Considerable difference among varieties was observed in ability to withstand low temperature. European or southern varieties generally proved less resistant than those grown in northern areas

of the United States, this variation existing both in seedlings and mature plants.

The immediate effect of gametic relationship and of parental type upon the kernel weight of corn, T. A. KIESSELBACH (*Nebraska Sta. Research Bul. 33 (1926), pp. 69, figs. 5*).—Elaborate investigations to determine the relation of the kernel weight of corn to the source of pollen with which it was fertilized involved in various aspects commercial varieties, strains inbred to different degrees or selected for certain purposes, and seasonal, kernel, and endosperm types. The relative moisture contents of pure and hybrid kernels, sources of experimental error in tests, the effect of crossing upon the endosperm character, and the color of various corn types were also dealt with. See earlier work along the same line (E. S. R., 52, p. 336).

Consideration of the extensive data suggested that in general practical advantages are not to be expected from annually mixing seed of commercial varieties of corn. The effect of cross-pollination occurring in comparative yield tests of commercial varieties similar in endosperm type does not seem to be of sufficient magnitude to be a serious disturbing element in arriving at correct conclusions.

The kernel weight increases of sweet varieties when fertilized by starchy types and of inbred strains and F_1 hybrids between two pure lines when fertilized by foreign pollen are large enough to suggest that the acre yields may be affected thereby. In this event such yields may not accurately represent their productivity in comparison with other corn. Serious yield effects due to source of pollen under field conditions seem unlikely with double crosses and synthetic varieties because of their more complex constitution.

Cotton fertilizers and varieties, J. F. O'KELLY, C. B. ANDERS, and W. W. HULL (*Mississippi Sta. Bul. 241 (1926), pp. 12, fig. 1*).—Additional fertilizer investigations with cotton led to conclusions in harmony with those noted earlier (E. S. R., 55, p. 33). Cook, Cleveland strains, and Half-and-Half made highest average yields, and Delfos, Cleveland 54, Trice, and Miller were foremost in acre value during the period 1922–1926. D. & P. L. No. 6, Deltatype Webber, Delfos selections, and Trice were high as to acre value among the standard varieties compared in 1926. Watson, Super Seven, Lightning Express, and Dixie Triumph led in acre value in the wilt-resistance test.

Studies on Festuca ovina.—I, Normal, sexual, and partially and wholly viviparous types of northern origin [trans. title], G. TURESSON (*Hereditas, 8 (1926), No. 1–2, pp. 161–206, figs. 14; Eng. abs., pp. 200–205*).—The extensive studies reported on were concerned with sexual and partial and wholly viviparous types of *F. ovina eu-ovina vulgaris*, collected in their natural habitats in Scandinavia, the Faroes, and Scotland, and grown in comparative cultures to determine the nature of different characteristics (whether modificatory or genetic) and to ascertain how climatic and edaphic factors control the composition of the population in various natural habitats.

[Peanut production in Gambia], A. J. BROOKS (*Gambia Dept. Agr. Ann. Rpt. 1925, pp. 13–21, 22–25, 29–33, 47–52, pl. 1*).—Fertilizer and variety trials with peanuts and analyses of varieties are reported, and the status of the industry in the colony is reviewed, with an account of marketing practices.

Studies of self-fertilization in rye, H. E. BREWBAKER (*Minnesota Sta. Tech. Bul. 40 (1926), pp. 40, figs. 10*).—Continuous selection of single plants of Minnesota No. 2 rye with distance isolation of the progeny lines for 10 years resulted in several lines highly pure for grain color and relatively so for certain other characters. The presence of many seedling and plant abnormalities characterized certain of these strains. Inheritance studies of yellow-green stripe,

golden-green blend, and virescent white, abnormal types recognizable in seedling or plant stages, as well as a brittle plant character (E. S. R., 51, p. 848) indicate each to be a simple recessive to the normal condition. A number of individuals in the selfed strains as well as in the Minnesota No. 2 variety appeared highly resistant to *Puccinia graminis secalis*.

No consistent difference was apparent in degree of seed setting as a result of fertilization within a single floret or between two florets on the same head. The characters, high and low self-fertility, appeared to be heritable. Ability to set seed under controlled conditions was evidently influenced considerably by seasonal conditions. The approach toward homozygosity in the selfed strains was generally accompanied by marked reduction in vigor, considerable shriveling, and lack of plumpness in the grain, and some reduction in plant height. While in general there was a reduction in vigor and yield, certain strains appeared to be promising in comparison with Minnesota No. 2 rye.

The behavior of the P. O. J. 234 cane in Tucuman and elsewhere, W. E. CROSS (*Planter and Sugar Manfr., 77 (1926), No. 18, pp. 350, 351*).—P. O. J. 234 has surpassed native sugar canes in Tucumán under mosaic conditions, although apparently it did not equal P. O. J. 36 and 213. In Spain P. O. J. 234 is considered superior to native cane and the two other Java canes. The author feels that P. O. J. 234 in Louisiana might give results similar to those in Tucumán.

Story of sugar in Hawaii (*Honolulu: Hawaiian Sugar Planters' Assoc., 1926, pp. 96, pls. 3*).—This book gives information on the history and development of the sugar industry in Hawaii, outlines the principal factors involved in the production of cane sugar in the Territory, and indicates the commercial status of Hawaiian and other American sugar.

Tobacco: Its cultivation and preparation, G. CORBETT (*Mauritius Dept. Agr., Gen. Ser. Bul. 33 (1926), Eng. ed., pp. 30, pls. 9*).—Information concerning the production of dark and bright cured leaf is presented for Mauritius, based extensively on practice in southern Africa. Insect pests are described by W. H. Edwards and diseases by E. F. S. Shepherd.

Wheat experiments at the Northern Montana Branch Station, G. W. MORGAN and M. A. BELL (*Montana Sta. Bul. 197 (1926), pp. 48, figs. 14*).—Experiments with spring and winter wheat during the period 1917–1925, inclusive, dealt with the effects of methods of preparing the seed bed and of the preceding crops on the yield and variety trials, all on dry land. The quality of wheat in Montana and soil and climatic conditions in the locality are discussed in some detail. Information on experimental methods, tillage operations, milling and baking trials, the yields of wheat in rotations, and wheat varieties are appended.

Climatic conditions in northern Montana are described as semiarid, with the heaviest precipitation in summer. The total amount and distribution of rainfall in June and July have an important relation to the wheat yield, as also have temperature and wind. Six seasons during 9 years of experimental work were considered unfavorable and three as average or above.

Spring wheat made its highest average yield, 13.4 bu., on fallow (E. S. R., 52, p. 527), exceeding those on disked corn ground, spring plowing, and fall plowing in 5 of 9 years. The yield after continuous cropping was 7.1 bu. and on disked ground 10.7 bu. Yields on disked corn ground in manured rotations slightly exceeded those in similar but unmanured rotations. Spring plowing for spring wheat (average 10.5 bu.) surpassed fall plowing (average 9 bu.) in 6 of 9 years.

Spring wheat immediately after sunflowers yielded much less than after corn, whereas yields the second year after these crops were about the same. Cereals

and pea-grain mixtures grown for hay were not desirable substitutes for fallow, wheat yields on disking after such crops resembling those obtained by continuous cropping. Russian thistles, the worst weed pests in spring wheat, were usually thicker on early than on later seeding. However, delaying seeding for a week or 10 days after preparing the seed bed and immediately preceding the drill with a light, thorough cultivation controlled Russian thistle growth and increased yields.

Marquis and Supreme, outstanding among the hard red spring varieties, are recommended for general production. Peliss led the durums and Baart the white wheats.

Winter wheat gave unsatisfactory results chiefly because of severe winter-killing followed by excessive weediness. Winter wheat on fallow plowed in May yielded much higher than that on fallow plowed in July. Manure applied before plowing for fallow slightly decreased the yields. Yields on fallow plowed 8 in. deep surpassed those on shallower or deeper plowing. Compared with ordinary fallow a decrease in the winter wheat yields followed crops of rye, peas, and sweet clover turned under for green manure.

Results of seed tests for 1926, M. G. EASTMAN (*New Hampshire Sta. Bul. 226 (1926), pp. 18*).—The percentage germination and purity are tabulated for 369 official samples of agricultural seed collected in New Hampshire and tested during the year ended June 30, 1926.

[Report of Canadian Seed Growers' Association, 1924–25] (*Canad. Seed Growers' Assoc. Ann. Rpt. 1924–25, pp. 82, pl. 1, figs. 7*).—The annual meeting held at Edmonton, Alta., in June, 1925, is reported, and the activities of the association and its branches during the period of March, 1924, to March, 1925, are reviewed.

HORTICULTURE

[Horticultural investigations at the Arizona Station], F. J. CRIDER and D. W. ALBERT (*Arizona Sta. Rpt. 1923 pp. 477–485, figs. 4*).—The usual annual report (E. S. R., 53, p. 740).

Work in date propagation recently noted in bulletin form (E. S. R., 56, p. 239) is again discussed. Among promising date varieties are Saidy, Iteema, Hayanay, Tadala, and Maktum. Saidy is believed especially well suited to the foothill and mesa districts of southern Arizona, where the ripening season is long and humidity low. The Tadala was found one of the few early varieties not injured by humid weather.

Notes made in a young citrus orchard established at Yuma in 1920 showed some fruiting in Marsh Seedless grapefruit and Washington navel orange. Ammonium sulfate applied at the rate of 4 lbs. per tree per year in four divisional doses resulted in darker foliage and more vigorous growth. Legume cover crops used at Yuma required seed inoculation to succeed.

A study of the distribution of the roots of citrus trees growing in a sandy soil at Yuma showed in the case of 3-, 6-, and 25-year-old trees 41.42, 44.55, and 3.02 per cent of roots in the upper foot and 14.68, 39.27, and 24.17 per cent, respectively, in the second foot. In the case of the 25-year-old tree 0.05 per cent of the roots occurred in the ninth foot. Similar observations upon a 25-year tree growing in a sandy loam underlaid with tenacious subsoil in the Salt River Valley gave 17.09, 47.89, 24.8, 10, and 0.24 per cent of the roots in the first to fifth feet, respectively, and none at greater depths. Soil moisture determinations made in cooperation with the agricultural chemistry section showed following irrigation a decided loss in the first 3 ft. of soil. The wilting point was reached in about 12 days in the upper foot, suggesting the advisability of fre-

quent irrigations. The ball of earth about the roots of newly set trees dried more rapidly than did the surrounding soil.

Athel trees planted as windbreaks about citrus orchards at Yuma continued to send roots into the citrus orchard despite a 5-ft. open trench. Bud selection studies in the Salt River Valley revealed several promising strains of Washington navel orange. Studies pursued for 3 years with the olive showed no effect of pruning upon fruit size. Among vinifera grapes tested the Malaga and Sultanina appeared especially adapted to southern Arizona. Other promising varieties included Black Muscat and Almeria.

A comparison of long, short, and intermediate types of pruning upon deciduous fruit trees showed the intermediate to be most satisfactory, giving size and quantity.

Pecan trees failed to thrive on shallow soils underlaid with hardpan or on those strong in alkali. Difficulty in transplanting pecans was overcome by severe top pruning at the time of planting and shading during the first season. Success, Schley, and Delmas appeared to be promising varieties. At Prescott Dry Farm apples, pears, peaches, plums, cherries, grapes, and currants produced fair crops despite a very low rainfall, averaging 15.42 in. per year. Small fruits in the Greaterville district thrived once the plants were established, even though the rainfall amounted to only 16 in.

At Yuma acid phosphate was found to have a remarkable effect in hastening the maturity and increasing the compactness and size of lettuce. Potash and sulfur and various forms of nitrogen used singly had no appreciable effect, but a combination of blood meal and acid phosphate gave excellent results.

Report of horticultural work at the South Mississippi Experiment Station for 1926, E. B. Ferris and W. S. Anderson (*Mississippi Sta. Bul. 238 (1926), pp. 11, 12–16, 17, 18*).—A test of some 500 selections of wild blueberries collected in Florida showed a few types sufficiently promising to warrant propagation. In a fertilizer test with tomatoes the largest yield increase and the greatest net profit per acre were obtained with a mixture of 450 lbs. of nitrate of soda, 675 lbs. of acid phosphate, and 150 lbs. of sulfate of potash, a formula practically the same as the most successful of the preceding year (E. S. R., 55, p. 235). Data are presented upon the results of variety tests with peaches, plums, almonds, apples, pecans, persimmons, figs, grapes, strawberries, and other fruits. A comparison of dust and spray for the control of insect and fungus pests of the peach gave inconclusive results, both materials yielding clean, attractive fruit. On grapes spray gave somewhat better control of leaf diseases. Vinifera grapes on native roots proved a decided failure, and attempts to propagate *Pyrus calleryana* stocks met with completely negative results.

[Horticultural investigations at the Wisconsin Station] (*Wisconsin Sta. Bul. 388 (1926), pp. 42–45, 45–47, 75*).—In the same manner as the preceding (E. S. R., 53, p. 438), this report discusses progress in various horticultural lines.

Breeding work with canning peas conducted by E. J. Delwiche and E. Renard recently presented in bulletin form (E. S. R., 56, p. 236) is again discussed. At the Marshfield Substation it was found that on soils of the prevailing type at least 3 to 5 years should elapse between pea crops. At the Spooner Substation the Scotch and Golden Vine varieties yielded 28 bu. of seed per acre. Impurities in pea stocks arose from natural crossing and less frequently from mutations. Persistent removal of these odd plants is deemed essential to the maintenance of satisfactory seed stocks.

Pollination studies conducted by R. H. Roberts at Sturgeon Bay upon certain cherry trees which had failed to yield despite abundant blooming showed these to be self-sterile and also intersterile with several varieties. However, when pollinated with Early Morello, Governor Wood, Elton, and an unknown sort, excellent sets of fruit were obtained. Studies of the effect of pruning and of shortening the period of daylight upon blossom bud formation in nitrated and nonnitrated apple trees failed to show any specific influence of either treatment upon the composition or performance of the trees. Pruned trees without nitrogen fertilizer tended to be fruitful, while those with an excess of nitrogen tended to be unfruitful. Trees given a short period of daylight tended to be fruitful without nitrogen and unfruitful with nitrogen. In the case of normal daylight trees nitrogen promoted fruitfulness. Thinning the fruits of Wealthy and Duchess resulted in improved grades and larger yields.

Roberts, reporting upon grafting studies, states that the top bud usually makes the best growth, that the callus union takes place along the matched tongues of the graft, and that the rapid rise of sap is in a vertical line.

Three new yellows-resistant types of cabbage developed by J. C. Walker are described. These are named All Head Select, Marion Market, and Globe.

[Vegetable studies at the Raymond, Miss., Substation], H. F. Wallace (*Mississippi Sta. Bul. 240 (1926), pp. 11–14*).—As usual (E. S. R., 55, p. 236) the tomato because of its commercial importance received the greatest consideration. The Gulf States Market was the highest yielding variety of eight tested, but the fruits were rather small. The wilt-resistant varieties, Norton, Marvel, and Marglobe, proved valuable on infected soil. Of several fertilizer treatments compared for tomatoes, the greatest net profit per acre was obtained from a 2,000-lb. application of 3–8–3 (N–P–K) mixture. No significant differences in yield or earliness were obtained with mixed fertilizers, the nitrogen of which was derived from different sources. Potash added in varying amounts to mixed fertilizers gave no definite results but on account of the effect upon the plant is deemed an essential ingredient. Work with garden peas and beans suggested the desirability of a 3–10–3 (N–P–K) mixture with the nitrogen derived from ammonium sulfate.

Sunshine sweet corn, A. F. Yeager (*North Dakota Sta. Bul. 205 (1927), pp. 8, figs. 4*).—A brief discussion of the parentage, methods employed in the development, and the important characteristics of the Sunshine variety of sweet corn produced by the station.

The home fruit garden on the northern Great Plains, W. P. Baird (*U. S. Dept. Agr., Farmers' Bul. 1522 (1927), pp. II+49, figs. 30*).—Emphasizing the fact that cold and drought greatly handicap fruit production on the northern Great Plains, the author presents helpful information discussing such points as climate, selection of site, protection from wind, planting, culture, spraying, pruning, and planning the home fruit garden. Particular attention is paid to the species and varieties which have proved suitable to the region.

The propagation of fruit tree stocks by stem cuttings.—I, Observations on the factors governing the rooting of hard-wood cuttings, R. C. Knight (*Jour. Pomol. and Hort. Sci., 5 (1926), No. 4, pp. 248–266*).—In trials with various hardwood cuttings no direct association was found between callus formation and root production. Callusing was apparently favored by high water content of the soil and rooting by a medium water content which favored adequate aeration. The formation of callus and of roots are considered distinct processes, having no consequential relation to each other, and callusing is deemed no assurance of rooting. The immersion of cuttings prior to planting in solutions of potassium permanganate, boric acid, and phenol gave no con-

sistent results. Potassium nitrate, on the other hand, definitely reduced rooting in the Brompton plum. Sugar solutions in favorable concentration benefited rooting in certain varieties.

Propagation of apple trees on their own roots, F. S. LAGASSÉ (*Delaware Sta. Bul. 147 (1926), p. 28*).—The third sentence in the final paragraph of a previous abstract (E. S. R., 56, p. 341) reading "3-in. scions were slightly better than those 2 in. in length" should read "Stayman scion wood 3 ft. in length gave a slight increase in stand over 2-ft. lengths."

Normal variation in the chemical composition of fruit spurs and the relation of composition to fruit bud formation, C. P. HARLEY (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 134–146, fig. 1*).—Analyses at the University of Maryland of Stayman Winesap spurs showed a much higher variability in the chemical content in samples of variable lengths and age than in uniform samples. Old growths were more variable than new growths, indicating the desirability of restricting the samples to the new growth. At the time of flower-bud differentiation nonbearing spurs averaged 31.1 sq. in. of leaf area as compared with 16.13 for bearing spurs. At the same time the bearing spurs averaged more leaves, due to many small leaflets on the cluster base. The optimum spur length for Stayman Winesap in respect to number of blossom buds was 25 mm. (1 in.). Seasonal changes in spur composition were not as clearly defined in old as in new growth. High sugar and starch content in new spur growth at differentiation time suggests the importance of these substances at this stage. A correlation was noted between leaf area, starch content, and flower-bud formation. A decrease in December of polysaccharides and an increase in free reducing substances and total sugars indicated a hydrolysis of acid hydrolyzable materials related possibly to low temperatures. A high percentage of nitrogen was present in new growths of bearing spurs following fruit setting. Dry matter content of spurs increased uniformly as the season advanced. At the time of fruit-bud differentiation nonbearing spurs were relatively high and bearing spurs relatively low in starch as compared to nitrogen.

Some studies on the fruiting habit of the York Imperial apple, M. J. DORSEY (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 172–189*).—Studies by the West Virginia Experiment Station upon York Imperial trees in three commercial orchards in different conditions of vigor and productivity indicate that in old, unpruned trees, or those making slow growth, there is a marked tendency to develop too many growing points, which gradually become fruiting spurs and ultimately result in the production of many small fruits. Complete alternation of bearing was associated with an overabundance of short spur growths. Nitrate of soda without pruning stimulated growth, bloom, and set in the shorter growths. It is believed that a well-distributed pruning, accompanied or not by an application of nitrate of soda, will induce an improvement in the size of fruit which can not be obtained by nitrates alone. Detailed pruning alone resulted in a growth response on unproductive 20-year-old trees equivalent to a 3-lb. nitrate treatment. In certain trees large limbs were observed to act independently, becoming in a measure separate entities. Little evidence was obtained to indicate that alternate fruiting habit in York Imperial can be overcome.

The relation of growth to fruitfulness in some varieties of apple, M. J. DORSEY and H. E. KNOWLTON (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 161–172, figs. 5*).—Records taken by the West Virginia Experiment Station upon the growth of Grimes, Rome Beauty, Ben Davis, and York Imperial apple trees included in fertilizer experiments show that Ben Davis and Rome Beauty,

because of their terminal bearing habit reach their maximum fruitfulness on much longer twigs than do Grimes and York Imperial. Nitrate of soda applications to Rome Beauty trees increased the percentage of blossoms on shorter length classes, but not on classes over 6 in. A study of the relation of the length of the preceding season's growth to the set of fruit showed in Rome Beauty and Ben Davis higher percentages of set associated with longer growth, and, though less clearly defined, the same tendency was observed in York Imperial and Grimes. Nitrate applications modified the length distribution of Rome Beauty spurs, reducing by one-half those in the ⅛ in. class. Percentages of spurs in the longer growth classes which both bloomed and set were markedly increased by nitrate applications. The percentages of set followed in a general way those of bloom.

Temperature and respiratory enzymes of apples, B. D. DRAIN (*Bot. Gaz., 82 (1926), No. 2, pp. 183–194, pl. 1*).—Determinations made at the University of Chicago of the respiration rate at 0 and 25° C. (32 and 77° F.) for Maiden Blush, Oldenburg, and Winesap apples showed that varieties vary greatly in respiration rate and response to temperature. The rate for Oldenburg varied but little with temperature changes, while that for Maiden Blush was greatly slowed down at 0°. Catalase activity, as indicated by the hydrogen peroxide test, was considerably lower in Oldenburg than in Winesap. Catalase was particularly active in the periphery of the fruits. Oxidase determinations showed a decreased activity when the fruit was hard ripe. In the fruit of many varieties oxidase activity tended to be localized near the core, while in others the zone of greatest activity was in the periphery. That the localization of oxidase activity may be due to gaseous exchange was indicated in a long-continued negative activity in the core region with fruits in which the calyx tube was sealed at the hard ripe stage. Determinations of iron in Winesap apples showed the greatest concentration in the periphery, i. e., in the same general region as that of catalase activity.

Responses of the sour cherry to fertilizers and to pruning in the Hudson River Valley, H. B. TUKEY (*New York State Sta. Bul. 541 (1927), pp. 26, pls. 5, figs. 2*).—Pointing out the growth and fruiting characteristics in the Early Richmond, Montmorency, and English Morello cherries and the high correlation between vigorous annual growth and productivity, the author discusses the results of fertilizer and pruning studies with these cherries.

Of various fertilizer combinations applied, only those containing nitrogen had any material effect upon the growth of new wood. None of the materials had any effect on yield the first season. Duplications of the applications in the spring of the second season resulted in material yield increases on the nitrogen plats, increases which were even greater the third season. Apparently the first season applications increased shoot growth, some of the longer ones fruiting in the second season and some bearing spurs which in the third year contributed to production. Measurements of trunk diameter from year to year showed a distinct correlation between yield and girth increase, which was most pronounced on the nitrogen trees. The leaves of the nitrogen trees were conspicuously larger, but the maturity of fruit was delayed as much as 10 days.

A comparison of no treatment, pruning, and pruning plus nitrogen showed that severe pruning checks growth significantly, but when supplemented with nitrogen the pruned trees recovered quickly, soon surpassing the control trees in yield. Apparently all three varieties responded in much the same manner to pruning and nitrogen fertilization.

Raspberry breeding experiments: Hybrids and back crosses between red and black varieties, G. M. DARROW (*Jour. Heredity, 17 (1926), No. 9, pp. 318–*

348, figs. 6).—Pointing out that practically all the newer varieties of raspberries are being produced by systematic breeding rather than chance selection, the author discusses the work at the U. S. D. A. Horticultural Field Station, Glen Dale, Md.

In crossing red and black raspberries no hybrids were obtained when the red was used as ovule parent. Hybrids between Winfield (black) and Golden Queen yielded purple fruit practically indistinguishable from that produced by the progeny of Winfield × Cuthbert. Marked differences were noted in the fertility of the progeny of different crosses. Progeny of Winfield crossed with Golden Queen, Cuthbert, and Marlboro were mostly sterile, while Winfield × Newman and Farmer × Latham gave a high proportion of fertile seedlings. Crosses of purples with reds yielded promising seedlings, some of which bore firmer fruits than that of either parent or of any known raspberry. Furthermore, these back-cross progeny covered a greater range in ripening season than their parents, some maturing later than any known variety.

Banana culture in Hawaii, W. T. Pope (*Hawaii Sta. Bul. 55 (1926), pp. 48, pls. 17*).—This paper, devoted principally to the description of varieties, discusses the history and distribution, botanical characters of the plant, flowers, and fruit, composition and food value, methods of propagation, cultural requirements, harvesting and shipping, and the control of pests.

The Regal lily, D. Griffiths (*U. S. Dept. Agr. Bul. 1459 (1926), pp. 19, pls. 4*).—The Regal lily, a comparatively recent introduction from north-central China, has been found to lend itself readily to propagation from seed, which may be sown either in the greenhouse or outdoors. Except for a susceptibility of new growth to late spring frosts, this lily has proved perfectly hardy and holds great promise as an outdoor as well as a forcing plant. Stem bulblet formation may be induced by subjecting the bulb to unfavorable cultural conditions, which apparently arrest normal development. The various practices involved in the propagation, culture, handling, and forcing of bulbs are discussed in detail, together with notes on habits of growth, resistance to pests, etc.

American bulbs under glass, D. Griffiths (*U. S. Dept. Agr. Bul. 1462 (1926), pp. 23, pls. 11, fig. 1*).—Observations upon the behavior in a forcing house of a large variety of American-grown bulbs, tulip, narcissus, lily, etc., indicated that very satisfactory results may be obtained with such stocks if properly grown and handled. Uniformity and constancy in behavior such as characterizes imported stocks can not be expected in the general run of home-grown material but may be secured if the stock is grown in a single location with exacting care. The cutting of the flowers apparently reduced the forcing value of tulips. The size of the bulb was found to be an important consideration, and large size may be secured by allowing sufficient space per bulb and in retention of large sized bulbs among those saved as parent stock.

It was found that bulbs are very easily injured in storage and in transit by overheating and rough handling, and that such treatment is the source of much of the disease manifested in native material. Suggestions are given as to the better practices in culture and in storage. Broken-flowered mutants frequently occurring in tulips are believed due to a virus disease, and if these offtypes are grown at all it is advised that they should be isolated from normal stock.

House plants, A. Laurie (*Michigan Sta. Circ. 99 (1926), pp. 18, figs. 16*).—General information is presented upon the light, moisture, air, and soil requirements of various house plants, together with instructions for controlling pests. Suggestions are given upon the preparation and arrangement of window boxes and hanging baskets, with lists of plants adapted for these special uses.

FORESTRY

A study of the vegetation of northeastern Arizona, H. C. Hanson (*[Nebr.] Univ. Studies, 24 (1924), No. 3–4, pp. 94, pl. 1, figs. 33*).—Studies of the forest and ground cover in the vicinity of the San Francisco Mountain in northeastern Arizona showed six rather distinct plant formations, namely, Alpine meadow, subalpine, montane, woodland, grassland, and sagebrush. The plant species occurring in four of these vegetational types are carefully enumerated, and the underlying causal differencies such as elevation, temperature, soil, rainfall, and wind exposure are discussed.

Root studies with the Scotch and Austrian pines [trans. title], E. Hesselink (*Meded. Rijksboschbouwproefsta. [Wageningen], 2 (1926), No. 3, pp. [3]+187–278, pls. 27; Ger. abs. pp. 241–249*).—Following up a suggestion that the quotient obtained by dividing the total length of roots by the number of growing root tips might be constant for forest species, records were taken at the Wageningen Forest Experiment Station, Holland, upon young trees of the Scotch and Austrian pines. It was found that in seedlings grown in the same soil the root quotient was quite constant at any one time, even though the root lengths of individuals in a species varied sharply. On the other hand, considerable variability was recorded in the root quotient of the same plants measured at different times in the growing period. A temporary rise found in the root quotient in late summer suggests that at this season the tendency arises for the greater extension of the roots rather than for the formation of new roots. Observations upon the comparative root development in drift sand and in good soil showed that the root quotient is also affected by environmental factors. The death of roots in unfavorable soils resulted in a high root quotient. Studies of the effect of root pruning upon the quotient showed no lasting influence; in Scotch pine the balance was restored the following season and in Austrian pine the same season, providing pruning was carried on very early in the spring.

Observations upon older trees showed that the root quotient is greatly disturbed by the various relations under which the roots are growing. Length development was large in poor soils except where drought had injured the roots, and often very poor soil limited normal extension. The root quotient of the Scotch pine was different from that of the Austrian pine and in fact varied between the strains of a single species.

The inter-relationship of yield and the various vegetative characters in Hevea brasiliensis, R. A. Taylor (*Ceylon Dept. Agr. Bul. 77 (1926), pp. 67, pls. 13, fig. 1*).—This is a further report (E. S. R., 51, p. 444) upon the behavior of a population of Hevea trees descended through the medium of open-pollinated seed from a single productive parent. Yield records taken in the 1923–24 and 1924–25 seasons showed a tendency for the low-yielding trees to improve and for the high yielders to lose some of their original lead. Although the inter-relationship between yield and cortex thickness remained practically constant during four years, that between yield and girth became less marked and that between yield and the number of latex vessel rows increased. An increase in yield, on the other hand, showed no marked relation to any other character, leading the author to suggest that yield is probably an inherent quality independent of the factors which control growth. Girth was, as expected, closely correlated with cortex thickness and less so with the number of latex rows. There was a marked correlation between the number of latex vessel rows in untapped cortex and that in renewing cortex, indicating that the number of rows is characteristic of the tree.

DISEASES OF PLANTS

Plant pathology, J. G. Brown and F. Gibson (*Arizona Sta. Rpt. 1923, pp 498–506, figs. 5*).—Notes are given of a number of diseases of economic plants, the data having been secured through surveys of various localities.

In continuation of a previous report (E. S. R., 53, p. 745) further experiments have shown the value of the use of concentrated sulfuric acid for sterilizing cotton seed. In addition to destroying disease organisms, the delinted seed was more readily planted, and germination was hastened by from one to five days.

Experiments on the effect of alkali on the prevalence of angular leaf spot of cotton made on plants grown in screened pots and in field tests seem to indicate that the amount of angular leaf spot was greater in the alkali-free plats. Primary infection was found to take place through the cotyledons. Later infections resulted from the movement of the bacteria through the petioles of the cotyledons, as well as from infected cotyledons coming in contact with plants.

A disease of mesquite trees, in which a number of trees were defoliated, was found to be due to *Scleropycnium aureum*.

A scalding of citrus nursery stock is briefly reported upon. Rhizoctonia and Pythium were found present, but it is believed that high temperatures and liberal irrigation may have contributed to the occurrence of the disease.

Treating lettuce seed with corrosive sublimate did not reduce the occurrence of bacterial slime in the variety New York Special. It is considered probable that the bacteria causing the disease were present in the soil, and that they gained entrance to the leaves after frost injury. The disease has been repeatedly produced in healthy plants in the laboratory through inoculation experiments.

[Plant disease investigations at the Wisconsin Station] (*Wisconsin Sta. Bul. 388 (1926), pp. 76–85, figs. 3*).—Investigations by J. G. Dickson on resistance of corn to seedling blight are said to have shown that resistance to the cortical rots is not a simple factor or group of factors but is closely associated with the plant metabolism and growth. The resistant corn strains are considered to be resistant principally because the cell walls of the protective sheath tissues are cellulose, impregnated with suberin, which prevents fungus penetration, and because the carbohydrate and protein materials available in the cell walls and cell protoplasm are not the most suitable for the rapid growth of the fungus. The penetration of the parasite and subsequent growth and blighting is checked or greatly retarded due to these conditions within the host plant. A similar set of reactions was found to be set up within the susceptible strains when they are grown at high temperatures, or under conditions most favorable for the corn seedling. It is considered that resistance to the cortical rots in corn is directly associated with the nutrition and growth of the corn seedling, and that so-called resistant strains have a greater capacity to produce a well-balanced, vigorous growth even under unfavorable environmental conditions.

In a previous publication J. C. Walker showed that resistance of onions to smudge depended on the presence of a toxic substance in the outer scales of the bulbs of colored varieties (E. S. R., 49, p. 843). Investigations on disease resistance in onions were continued to include studies of neck rot, Fusarium bulb rot, and black mold. Onions are found to be resistant to neck rot for the same reason as they are to smudge, the causal organism attacking the bulbs through the scales and coming in contact with the toxin. The Fusarium of

bulb rot attacks the root, and consequently is not destroyed as the toxin is only in the colored scales. The parasite of black mold was found not to be sensitive to the toxic principle.

Continued experiments on the control of barley stripe are said to have shown consistent control by Germisan and good results with Uspulun and Semesan. Barley smuts were likewise fairly well controlled by this treatment and seeding in a moderately cool soil.

Investigations of grain rusts reported upon consisted of studies on the overwintering of stem rust (*Puccinia graminis*) in the red rust stage and the nature of resistance of wheat to leaf rust (*P. triticina*). Several hundred tests made in March and April confirmed earlier findings that spores of the red rust stage do not live through the winter season under conditions of alternate freezing and thawing, such as occur in Wisconsin. The studies made on the resistance to leaf rust showed that the parasite enters the stomatal cavity in both resistant and susceptible wheat strains, but the subsequent development is different as the fungus mycelium within the stomatal cavity of the resistant wheat strain does not develop rapidly and frequently not much beyond the infection vesicle. In other instances the haustorium enters the cell, which results in the death of the host cell and subsequent death of the rust parasite.

Investigations by G. W. Keitt and E. E. Wilson on the control of apple scab and cherry leaf spot are reported, and it was found that there was a marked relationship between the time of leaf fall and the time of maturity of the spores of the apple scab fungus. Ascospores developed to maturity in leaves which fell in early fall much earlier than in those which remained on the tree until late fall or early winter. A discussion is given of the temperature relations of the fungus. For the control of cherry leaf spot plats of trees which had been sprayed with Bordeaux mixture and lime sulfur in 1924 received reversed treatments in 1925, with the result that in both seasons the weight of the fruit sprayed with lime sulfur was approximately 15 per cent greater than that of the fruit sprayed with Bordeaux mixture.

Field and laboratory work by Keitt and A. N. Brooks on fire blight and its control showed that the overwintering of the fire blight organism occurred not only in connection with cankers on the larger branches but also in blighted twigs as small as $\frac{1}{16}$ in. in diameter. Twig infection appeared in advance of blossom blight during the past year, and early in the season fully 90 per cent of it could be traced to rain-borne inoculum from suitably located hold-over cankers or twigs. Twig infection occurred at intervals until late July. Rain was found to be an important agency for the local dissemination of fire blight. The development of fire blight is said to be favored by temperatures of from 65 to 85° F., relatively high humidities, cloudy weather, frequent showers, infestations of aphids and leafhoppers, heavy blossoming of trees, the abundant activity of bees and other pollinating insects, the presence of large plantings of the more susceptible varieties, and a high stage of vegetative vigor of the host plant.

Studies by R. E. Vaughan and J. Brann are said to show that by the use of hot formaldehyde solution, 1 lb. of formaldehyde to 15 gal. of water, the control of potato scab is less expensive and less time is required than by some of the methods previously tested. It is recommended that potatoes should be treated in this solution for 2.5 minutes at from 122 to 125° instead of 1.5 hours as is practiced with corrosive sublimate. This treatment is also effective in controlling black scurf and blackleg as well as scab.

In continuation of studies of crown gall of apple trees, A. J. Riker and Keitt have shown that enlargements or growths on the apple trees of the type which

did not yield the crown gall bacteria are mostly the result of factors other than the crown gall organism. For the most part they appear to be overgrowths at points where the downward passage of food in the tree was interfered with, and in most cases this was due to the failure of some part of the scion to unite with the stock. An examination of several thousand apple grafts showed ample misfits to account for a large percentage of the root knot found. Root knots were readily produced by making ill-fitted grafts or wounding young trees.

Field studies by M. B. Linford and F. R. Jones on pea blight are said to have shown that root rot caused by *Aphanomyces euteiches* was much less destructive in 1925 than in 1924. There were, however, some districts where root rot was exceptionally severe, and these were chiefly in the Colby silt loam region where soaking rains kept the soil wet during a period of warm weather. The long persistence of the pea root rot organism in the soil is considered to be due in part at least to the fungus attacking other plants than peas. Preliminary tests with different varieties are said to have indicated that those which had been regarded as somewhat resistant to root rot may prove highly resistant to pea wilt.

A survey by Vaughan, L. R. Jones, and W. J. Zaumeyer of diseases of canning beans showed the presence of a bacterial disease, which causes the blighting of leaves and pods, and mosaic to be of common occurrence under Wisconsin conditions. One of the standard green canning varieties of beans, which is relatively resistant to the bacterial blight, is found to be seriously susceptible to mosaic.

Some factors in the incidence of plant diseases, F. J. F. Shaw (*Indian Sci. Cong. Proc.* [*Calcutta*], *10* (*1923*), *p. 192*).—Since the incidence of disease may be closely connected with the chemical and physical properties of the soil and with conditions of humidity and temperature, it is thought that mycological research should be on a physiological basis in order that the factors which contribute to the success of the parasite may be correctly estimated.

Epidemic plant diseases, F. T. Brooks (*Brit. Mycol. Soc. Trans.*, *9* (*1924*), *pt. 4*, *pp. 229–239*).—Contrasting the favoring conditions characteristic, respectively, of animal and of plant diseases, the author considers it safe to say that weather conditions are frequently or usually all important in determining whether or not a plant disease shall appear in epidemic form. These and other conditions are discussed in their respective bearings.

Economic mycology, B. T. P. Barker (*Jour. Bath and West and South. Counties Soc.*, *5. ser.*, *19* (*1924–25*), *pp. 137–140*).—Record is made of reports of field bean chocolate spot, lettuce ring spot (*Marssonia panattoniana*), apple and pear black scab (*Venturia inaequalis* and *V. pyrina*), potato blight (*Phytophthora infestans*), currant leaf spot (*Pseudopeziza ribis*), plum silver leaf, die-back (*Diaporthe perniciosa*), and leaf shot hole, and a pear fruit rot. Diseases of 19 economic plants are listed, the plants being affected with some 34 diseases associated with a nearly equal number of causal organisms.

Notes on plant diseases in 1924, H. Wormald (*East Malling* [*Kent*] *Research Sta. Ann. Rpt. 1924*, *pp. 110–119*).—These notes deal with potato blight (*Phytophthora infestans*); certain apple, hop, onion, quince, and plum diseases (associated with *Botrytis* spp.); so-called brown rot diseases, including sweet cherry blossom wilt (*Sclerotinia cinerea*); apple blossom wilt (*S. cinerea mali*); plum withertip (*S. cinerea pruni*); apple and quince fruit rot (*S. fructigena*); plum and cherry die-back (*Diaporthe perniciosa*, *Cytospora leucostoma*, and bacteria); cherry leaf scorch (*Gnomonia erythrostoma*) and small leaf (soil conditions?); apple and pear scab (*Venturia inaequalis* and *V. pyrina*); pear canker (*Nectria galligena*); apple nursery stock canker; apple tree root rot

(*Armillaria mellea*); pear root rot (*Roesleria hypogea*); apple fruit rot (*S. fructigena* or *Gloeosporium* sp.); quince leaf and fruit blotch (*Fabraea maculata* (*Entomosporium maculatum*) and *Phoma* spp.), and fruit rots (*S. fructigena* and *B. cinerea*); raspberry mildew (*Sphaerotheca humuli*), rust (*Phragmidium rubi-idaei*), and wilt (*Verticillium* sp.); currant and gooseberry defoliation (*Pseudopeziza* (*Gloeosporium*) *ribis*), rust (*Cronartium ribicola*), die-back (*Diplodia* sp.), mildew (*Microsphaera grossulariae*), leaf spot (*Phyllosticta grossulariae* and *Ascochyta* sp.); walnut fruit blotch (bacterial?) and leaf spot (*Marssonina juglandis?* (*Gnomonia leptostyla*)); hop powdery mildew (*S. humuli*), downy mildew (*Pseudoperonospora humuli*), wilt (*Verticillium* sp.), and leaf spot (*B. parasitica*); lettuce rust (*M. panattoniana*), soft rot (*Botrytis* sp.), downy mildew (*Bremia lactucae*), and a disease not named (*Marssonina* sp.); and lavender scab (*Phoma lavandulae* and *Septoria lavandulae*).

[**Plant diseases, Philippine Islands, 1924**], S. YOUNGBERG (*Philippine Bur. Agr. Ann. Rpt., 24 (1924), pp. 167–196, pls. 7*).—This portion of the acting director's report, covering the plant disease section and cooperative plant disease observations at the different stations, deals in some detail with the organization, identification, and recording of disease specimens (rice, sugar cane, abaca, coconut, and other miscellaneous crops), observations at Lamao, Tanauan, and La Carlota, eradication of coconut bud rot, eradication of abaca disease, system of survey and eradication, and a survey of abaca-growing provinces.

Botany and plant pathology, I. B. P. EVANS (*Union So. Africa Dept. Agr. Jour., 11 (1925), No. 6, pp. 571–576*).—A botanical survey of portions of South Africa is briefly reported. Diseases of the virus group, as here briefly noted, include a streak disease of maize and sugar cane, mosaic of sugar cane and other grasses, and peanut rosette. Citrus plant diseases include canker (*Bacterium citri*), brown rot (*Pythiacystis citrophthora*), and lemon leaf spot and orange center rot (*Alternaria* sp.). Diseases of other plants include tobacco wildfire (*B. tabacum*), potato wart, pineapple brown spot, and quince black rot. Storage studies include preliminary investigations on the physiology of stored fruit.

The germination of conidia of Botrytis cinerea in solutions of various substances [trans. title], K. STABITZKY (*Centbl. Bakt.* [etc.], *2. Abt., 65 (1925), No. 14–21, pp. 291–297*).—A tabulation is presented of the germination results obtained from spores of *B. cinerea* in solutions differing in concentrations of 52 substances.

A new species of Monochaetia, M. WILSON and F. C. FORD-ROBERTSON (*Brit. Mycol. Soc. Trans., 9 (1924), pt. 4, pp. 189–192, pl. 1*).—The fungus which is herein described as the new species *M. cryptomeriae* was found in November, 1921, on dead leaves of *Cryptomeria japonica* which were still attached to the cast shoots. Although at the time of subsequent examination the material had been kept dry in the laboratory for 14 months, the spores when released after soaking were in condition to germinate, and on agar they readily produced abundant mycelium.

Fruit-rotting Sclerotinias.—III, Longevity of buried brown-rot mummies, W. N. EZEKIEL (*Maryland Sta. Bul. 284 (1926), pp. 9–22, figs. 3*).—In continuation of investigations on the fruit-rotting Sclerotinias (E. S. R., 53, p. 448), studies were made of the duration of viability in peach brown-rot mummies under varying conditions. Preliminary experiments showed that burying mummies more than 1 in. below the surface of the soil prevented the growth of apothecia, but that no permanent effect was produced on the mummies unless they actually disintegrated before being again brought to the surface.

Extensive experiments, in which peach mummies were distributed in duplicate series at four different depths in both wet clay and dry sand soils, showed that in both soils the buried mummies disintegrated rapidly, while mummies on the surface were well preserved and produced apothecia. It is recommended that peach brown-rot mummies lying on the ground should be plowed under after rotten fruits are picked from the trees in the fall or before the early pink-bud stage of the blossoms in the spring.

Methods of disinfection of seed and soil in cereal culture [trans. title], M. M. Morón (*Rev. Facult. Agron. La Plata, 3. ser., 16 (1925), No. 1-2, pp. 157-163*).—Seed or soil disinfection methods here briefly outlined involve the employment of heat, electrification, formalin, copper sulfate, uspulun, caffaro (dust), hydrocyanic acid, and potassium cyanide.

Dry treatment of wheat seed for smut [trans. title], J. B. Marchionatto (*Rev. Facult. Agron. La Plata, 3. ser., 16 (1925), No. 1-2, pp. 88-92, figs. 2*).—The best protective results against *Tilletia tritici* were obtained with the dust treatment "polvo X," with no loss of germinability.

The effect of formalin on the vitality of seed wheat, E. Baker (*Union So. Africa Dept. Agr. Jour., 9 (1924), No. 5, pp. 454-457, fig. 1*).—It has appeared probable that 1 pt. formalin to 50 gal., possibly 1 pt. to 60 gal., of water is effective to control bunt of wheat, covered smut of oats or barley, or loose smut of oats. A tabulation of varietal percentages of germination after 1 to 52 weeks following treatments, as given, shows that the formalin-treated seed kept better than did the untreated seed, though a modifying (storage) factor is discussed. Apparently, seed wheat dipped in formalin and stored in the usual way does not suffer any great loss as to germinability.

The bacterial disease of wheat caused by Pseudomonas tritici (Hutchinson), Tewfik Eff. Fahmy and Tewfik Eff. Mikhail (*Agr. Jour. Egypt, n. ser., 1 (1923), No. 1, pp. 64-72, pls. 6*).—A disease of wheat which destroys the inflorescence, thus preventing seed formation, is distributed in patches throughout the infected fields. The disease may become evident at any stage of growth. The gummy substance formed by diseased plants contains vast numbers of bacteria, but so far as observed the bacterium *P. tritici* is not capable of producing the disease without the assistance of a nematode which is associated therewith, *Tylenchus tritici*. Apparently, the life histories of the nematode and of the bacterium are such that the nematode acts as carrier to the wounded parts of the plant. The disease is presumably spread by the use of seed carrying bacterial infective dust and nematode galls, also by sowing wheat in infected soil. Contemplated control measures are suggested.

Diseases of cabbage and related plants, J. C. Walker (*U. S. Dept. Agr., Farmers' Bul. 1439 (1927), pp. II+30, figs. 14*).—As a revision of Farmers' Bulletin 1351 (E. S. R., 50, p. 45), popular descriptions are given of a number of diseases of cabbage and other cruciferous plants, and suggestions are given for their control.

The life history of Polythrincium trifolii Kunze, J. S. Bayliss-Elliott and O. P. Stansfield (*Brit. Mycol. Soc. Trans., 9 (1924), pt. 4, pp. 218-228, pl. 1, fig. 1*).—"*P. trifolii* develops a rather loose stroma on the under surface of leaves of *Trifolium repens* and produces during the course of its life history more compact and deeply seated stromata, which bear pycnidia containing pycnospores (*Sphaeria trifolii* Pers.) capable of infecting fresh clover plants. These stromata, on the decay of the leaf, fall to the ground and function as sclerotia. On further growth perithecial cavities are produced, containing the asci and ascospores characteristic of a Dothidella and not of Phyllachora, as has been assumed by various authors."

A study of clover failure in Kentucky, E. N. FERGUS and W. D. VALLEAU (*Kentucky Sta. Bul. 269 (1926), pp. 139–210, figs. 21*).—Laboratory, plat, and field studies were made of red and alsike clovers to determine the causes of failures, the critical time in the growth of the plants, and when the failures of established stands occurred.

It is concluded that clover failure results indirectly from unfavorable nutritional environment and probably directly as the result of the attack of pathogenic organisms upon the roots, the direct causes being able to operate in direct proportion to the condition of the plant resulting from the indirect causes. Among the indirect causes enumerated are low or unbalanced fertility, unfavorable H-ion concentration, and poor aeration. The general conclusion is reached that clover failures, such as are experienced in Kentucky and probably in eastern United States, result from unfavorable nutrition, in which soil infertility, unfavorable temperature, and droughty soil conditions are contributing causes. Such conditions are said to develop plants that are seriously injured by pathogenic root organisms. The application of lime, manures, and fertilizers to soils on which clover fails regularly has been found to decrease the mortality rate of the plant. Such applications, however, do not materially increase root development in unfavorable subsoils.

Preliminary investigations of the parasitism of certain fungi causing boll rots of cotton, T. LAYCOCK (*Nigeria Agr. Dept. Ann. Bul., 4 (1925), pp. 32–49*).—Cotton internal boll disease at Ibaden is caused by a fungus, at present undetermined, but probably allied to Nematospora. Other fungi may contribute to the injury. The cotton stainer (*Dysdercus superstitiosus*) may carry and introduce the disease.

Anthracnose boll rot, caused by the supposedly facultative parasite *Glomerella* (*Colletotrichum*) *gossypii*, is one of the primary causes of the mummification and distortion of bolls, the damage being much more pronounced than in those caused by a Fusarium and as regards appearance distinguished with difficulty from the Glomerella rot.

Fusarium sp., occurring on both vegetative and reproductive parts of cotton, is a saprophyte and a less virulent boll-rotting factor than is the anthracnose organism. It is favored by damp conditions and is not concerned in the wilting of cotton in Nigeria.

Strains of Rhizoctonia solani Kühn (Corticium vagum Berk. and Curt.), H. R. BRITON-JONES (*Brit. Mycol. Soc. Trans., 9 (1924), pt. 4, pp. 200–210, pls. 2*).—During work in Egypt on cotton-seedling sore-shin disease (*R. solani*), the fungus was induced under experimental conditions to produce its fertile stage, *C. vagum*. Comparisons of the *R. solani* from cotton in Egypt with isolations of the same species from other countries showed considerable difference in the cultures. In order to ascertain whether these differences were permanent, the strains were grown under conditions permitting fair comparisons.

Some of the isolations proved to be easily distinguishable macroscopically, others with difficulty or not at all. The microscopic differences are considered as morphologically nonspecific. The name *C. vagum* (*R. solani*) is retained for the isolations compared as reported in this paper. At the same time it is recognized that the group contained several biological species or strains.

Two new cotton plant bacteria in Armenia [trans. title], P. KALANTARIAN (*Centbl. Bakt.* [etc.], *2 Abt., 65 (1925), No. 14–21, pp. 297–301*).—A cotton plantlet bacteriosis is ascribed to a bacterium to which the name *Bacterium erivanense* is applied. A bacteriosis of the older plant is described as due to the new species named *B. löhnisi*.

Rosette disease of peanuts (*Union So. Africa Dept. Agr. Jour., 11 (1925), No. 1, pp. 10, 11*).—Recent studies said to have been carried out at Potgietersrust, Pretoria, and Durban by H. H. Storey and A. M. Bottomley with the assistance of J. S. MacKay have shown, it is claimed, that *Aphis leguminosae* is able to transfer the infective agent from diseased to healthy plants. Trials with other suctorial insects, occurring commonly in the fields, have given negative results. Peanut rosette appears to belong to the group of so-called virus diseases.

Indexing of potatoes for mosaic (*Wisconsin Sta. Bul. 388 (1926), pp. 44, 45, fig. 1*).—In a previous publication (E. S. R., 53, p. 443) it was shown that potato tubers bearing the mosaic diseases can readily be detected in the greenhouse by the so-called indexing method. Through greenhouse operations about 2,500 bu. of seed potatoes are said to be available for planting in 1927. The results of the work are said to have indicated that on most of the indexed plats inspected the amount of mosaic found did not exceed 3 per cent, and in special cases where control conditions and handling operations were entirely satisfactory the mosaic count ranged less than 1 per cent. In the parent seed stocks grown on the same farms from which the indexed stocks were secured the mosaic counts ranged from 15 to 40 per cent. It is believed that continued reindexing of the improved stock will result in further reduction of the mosaic.

Apple tufts, C. C. Carpenter (*Bot. Gaz., 78 (1924), No. 4, pp. 414–423, figs. 6*).—Tufts in apples (white growths on the carpel walls of some varieties) are not fungi, but are tissue proliferations developed in carpel fissures. They are found in high percentages in some of the best keepers, though admittedly they may take part in decay. Tufts are not correlated with open core, open calyx, or abortive seeds. Slight differences appear in tufts produced in different apple varieties.

Citrus diseases and their control, H. S. Fawcett and H. A. Lee (*New York and London: McGraw-Hill Book Co., 1926, pp. XII+582, pls. 15, figs. 190*).—The authors brought together information relating to citrus diseases occurring in all parts of the world. After the general consideration of citrus disease investigations, types of diseases, their distribution, conditions affecting severity, principles of prevention and treatment, and specific diseases are considered in detail, the diseases being grouped under the headings root and trunk diseases; diseases of branches, twigs, and leaves; and fruit diseases. Where a disease attacks more than one group of plant organs it is described in the group where it appears to be the most destructive. Keys are given for the identification of diseases in the different groups.

An extensive list of publications referred to by the authors is given as a partial bibliography of the subject.

***Effects of spraying citrus trees on the composition and flavour of the* fruit**, C. F. Juritz (*Union So. Africa Dept. Agr. Jour., 11 (1925), No. 3, pp. 240–243*).—Arsenical spraying of orange trees was found to lower acidity and impair the flavor of the fruit without corresponding external alteration.

The operations against bud rot of palms in south India, W. McRae (*Indian Sci. Cong. Proc. [Calcutta], 10 (1923), p. 188*).—*Phytophthora palmivora* attacks the palmyra palm, *Borassus flabellifer*, and the coconut palm, *Cocos nucifera*, causing a rot of the bud or crown. Operations are referred to as having reduced annual deaths due to this rot from 100,000 in 1908 to 8,700 in 1921.

A mildewless rose-garden, W. DeP. Knowlton (In *The American Rose Annual. Harrisburg, Pa.: Amer. Rose Soc., 1925, pp. 86–88*).—Freedom from

close heat and from sudden temperature changes is credited as being perhaps the principal factor among those here described in connection with complete freedom from rose mildew in case of very susceptible rose varieties.

The conquest of mildew, H. H. HAZLEWOOD (*In The American Rose Annual. Harrisburg, Pa.: Amer. Rose Soc., 1925, pp. 81–85*).—Evidence obtained in New South Wales, Australia, is submitted as pointing to the conclusion that a total potash content of 3.79 per cent, available potash content 1.02–1.09 per cent, was the influential factor in preventing rose mildew attack in case of rose varieties known to be very susceptible to this disease. "It is not intended to convey the idea that this amount is necessary for mildew immunity." Testimony is cited regarding the protective influence of potash in such connection.

A cautionary word about fungicides, L. M. MASSEY (*In The American Rose Annual. Harrisburg, Pa.: Amer. Rose Soc., 1925, pp. 89–92*).—Outlining the exacting requirements of a protective fungicidal treatment for roses, more particularly as against mildew and black spot, and emphasizing the protective values of such fungicides as sulfur dust, Bordeaux mixture, and liquid lime sulfur for the control of these diseases, the author expresses a preference for sulfur-lead dust as causing less foliage discoloration.

The question of the transmissibility of violet smut (Urocystis violae) by violet seed [trans. title], H. PAPE (*Centbl. Bakt.* [*etc.*], *2. Abt., 65 (1925), No. 14–21, pp. 301–307, figs. 5*).—The (somewhat rare) occurrence is demonstrated of resting stages of *U. violae* in seed coats and appendages of *Viola odorata*.

Fungi parasitic on cultivated trees in Argentina [trans. title], J. B. MARCHIONATTO (*Rev. facult. Agron. La Plata, 3 ser., 16 (1925) No. 1–2, pp. 15–40*).—Parasitic fungi affecting cultivated trees over a wide range are systematically discussed.

A note on south Indian Loranthaceae and their host plants, P. S. JIVANNA RAO (*Indian Sci. Cong. Proc.* [*Calcutta*], *10 (1923), p. 191*).—Loranthus, 12 species, and Viscum, 8 species, attacking 68 hosts have been listed. The hosts exert a definite influence on the form of the parasite and also on the size and color of the leaves, and cases of polymorphism occurring in the Loranthaceae are believed to be identical in some respects to spike in the case of sandal (*Santalum album*).

The Loranthaceae attack several hosts which are parasitized by sandal, and the susceptibility of these hosts for the attack of either family suggests physiological affinity among the parasites and hosts on the one hand and between the Loranthaceae and Santalaceae on the other. Cases of double parasitism and phyllody have been reported.

A Rhizoctonia causing root disease in Uganda, W. SMALL (*Brit. Mycol. Soc. Trans., 9 (1924), pt. 3, pp. 152–166, pls. 2*).—In Uganda, the silky oak (*Grevillea robusta*), planted extensively as an ornamental, shade tree, and windbreak, is subject to root attack by white ants (*Termes bellicosus*), which may demolish the underground parts and cause a break at the ground level while the foliage still appears normal. This work of the termites is, however, claimed to be secondary to a weakening root attack by a Rhizoctonia, which occurs in trees up to five or more years of age. A study of the disease results in a technical description of the causal fungus, which is considered to be a new species and is named *R. lamellifera*. A fungus apparently identical with this has been found on tea, arnatto (*Bixa orellana*), *Coffea robusta*, and *Casuarina equisetifolia*. *Coffea arabica* has not yet been shown to be susceptible to this fungus.

Notes on Rhytisma acerinum and Rhytisma pseudoplatani, R. BRACHER (*Brit. Mycol. Soc. Trans., 9 (1924), pt. 3, pp. 183–186, pl. 1*).—The present preliminary account records observations made, during a cytological study of Rhytisma, on the general life history of that genus, the material having been collected in England, where it grows on *Acer pseudoplatanus*, and in America, where it grows on *A. saccharinum*. Life histories of the two forms are closely similar. The few minor differences are here recorded.

Observations on the "slime-fluxes" of trees, L. OGILVIE (*Brit. Mycol. Soc. Trans., 9 (1924), pt. 3, pp. 167–182, fig. 1*).—Investigations, beginning in 1921 on exudations from trunks and branches of trees, particularly elm, horsechestnut, apple, and willow, are outlined. The reddish flux of Huntingdon elm contained a Fusarium forming copious pink spore masses, an Oospora (Oidium), bacteria, and other organisms. The brown flux of elm and horsechestnut invariably contained a species of Oospora. An Oospora (Oidium), a sporing yeast, and a Fusarium were commonly but not constantly found. The flux also contained fluorescent bacteria, algae, and insect larvae. The apple tree flux, in and near Cambridge, always contained three nonsporing yeasts. The willow white flux contained an Oospora (Oidium), probably *O. ludwigii*, a sporing yeast and bacteria.

The first three kinds of flux persisted throughout the year. Calcium carbonate was abundant in the red and the brown flux. This is derived from the vessels of the wood, and it renders the reaction of the exudation favorable to the growth of organisms. The white fluxes originate in the bark, being always associated with wounds or unhealthy condition. They are more acid than the brown fluxes and persist only for a short time in the summer.

Observations on Camarosporium abietis n. sp., M. WILSON and R. B. ANDERSON (*Brit. Mycol. Soc. Trans., 9 (1924), pt. 3, pp. 144–151, pls. 2*).—A fungus is described as a new species, *C. abietis*, this form having been collected March 3, 1923, on *Abies lowiana* at Arniston, Midlothian. Lateral branches, destitute of leaves, bore black fructifications, though no signs of infection appeared on or near the main trunk. Though confirmatory experiments are still in progress, the fungus has appeared to be saprophytic only.

Tree mycorrhiza, R. PAULSON (*Brit. Mycol. Soc. Trans., 9 (1924), pt. 4, pp. 213–218, pls. 2*).—A close association of a fungus with a rootlet of a higher plant, constituting the phenomenon of mycorrhiza or fungus-root, occurs abundantly, almost without exception, in the case of *Quercus robur*, *Fagus sylvatica*, *Carpinus betulus*, *Betula alba*, *Castanea sativa*, *Pinus sylvestris*, and *Taxus baccata* in woodlands in southeastern counties at least, especially in those located on light soil. The object of the present notes, based for the most part on field observations, is to suggest that investigation following the lines indicated may assist in the elucidation of the hitherto unsolved question of the true relation that exists between the fungus and the root in the case of ectotropic mycorrhiza. Field studies afford considerable evidence in favor of the view that the relation is something more than that of parasitism, and that it is mutual or symbiotic. The observations, inferences, and conclusions are detailed.

Some observations on Fistulina hepatica and hollow, stag-headed oaks, K. W. BRAID (*Brit. Mycol. Soc. Trans., 9 (1924), pt. 4, pp. 210–213*).—Observations on hollowness and stag-headedness associated with the abundance of *F. hepatica* in oaks during 1921 and 1923 in Richmond Park inclined the author to the opinion that the insufficiency of wood vessels, rather than the lack or unavailability of water, is the primary factor in the production locally of

stag-headedness in oaks. "Fistulina apparently plays a large part in the hollowing of oaks in Richmond Park and is possibly also one of the main factors in causing stag-headedness." Certain observations are detailed.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The migrations of birds, A. WETMORE (*Cambridge: Harvard Univ. Press, 1926, pp. VIII+217, pls. 7*).—This account of observations on the migrations of birds was delivered in the form of six lectures before the Lowell Institute at Boston in the fall of 1925.

Birds of western Canada, P. A. TAVERNER (*Canada Dept. Mines, Victoria Mem. Mus., Mus. Bul. 41 (1926), pp. 380, pls. 84, figs. 315*).—In the introductory part of this work the author includes a discussion of classification, nomenclature, geographical distribution, migration, protection, means of attracting birds, bird study, permit principles, and ornithological literature, including books dealing with special groups of birds, books of special geographical interest, etc. This is followed by an illustrated key to the birds of western Canada. The main part of the work, presented under the heading of descriptive ornithology (pp. 35–352), is systematically arranged and gives descriptions of the known birds of western Canada, together with their nesting, distribution, habits, and economic status. A glossary and a complete subject index are included.

Birds of the Netherlands, II, E. D. VAN OORT (*De Vogels van Nederland. The Hague: Martinus Nijhoff, 1926, pt. 2. pp. VIII+265, pls. 83*).—This second volume of the work previously noted (E. S. R., 50, p. 355) deals with the orders Falconiformes (pp. 1–96), Galliformes (pp. 97–124), Gruiformes (pp. 125–166), and Charadriiformes (pp. 167–253). Seventy-two forms are described, illustrated by numerous colored plates.

Unique method of pollination by the ruby-throat, A. L. PICKENS (*Auk, 44 (1927), No. 1, pp. 24–27, figs. 5*).—The author reports upon the cross-pollination of *Macranthera lecontei*, found growing along the Gulf Plain from Georgia to Mississippi and blooming in the summer and fall, by the rubythroat (*Archilochus colubris*), which carries the pollen on the back of its head.

Wild plants and seeds for birds, R. MORSE (*London: Cage Birds, 1926, pp. 110, figs. 22*).—This is a small illustrated dictionary of the best foods for use in the aviary.

A synopsis for the identification of the amphibians and reptiles of Indiana, G. S. MYERS (*Ind. Acad. Sci. Proc., 41 (1925), pp. 277–294, fig. 1*).—Keys are given for the separation of the amphibians and reptiles of Indiana.

Comparative value of sodium hydroxide, copper sulphate, and fermentation in disinfecting human excreta containing eggs of hookworms (Necator americanus) and of Ascaris (Ascaris lumbricoides), C. W. STILES (*Jour. Parasitol., 13 (1926), No. 1, pp. 47–55*).—The author's investigations show that copper sulfate and sodium hydroxide are good disinfectants for use against hookworm eggs. Fermentation was found to be a satisfactory method of killing eggs of Ancylostoma, Necator, and Ascaris, provided the process was continued long enough.

A synopsis of the families and genera of Nematoda, H. A. BAYLIS and R. DAUBNEY (*London: Brit. Mus. (Nat. Hist.), 1926, pp. XXXVI+277*).—In this compilation the authors have made some important proposals in regard to classification and have themselves examined material representing a large proportion of the parasitic genera.

Dr. Ransom's bibliography, compiled by A. HASSALL (*Jour. Parasitol., 13 (1926), No. 1, pp. 10–15*).—This is a complete list of the writings of B. H. Ransom, extending from 1900 to 1924.

Entomology, C. T. VORHIES (*Arizona Sta. Rpt. 1923, pp. 475, 476*).—In referring to bee culture mention is made of honey from Hubam sweet clover, which is said to be darker and inferior in flavor to mesquite and cat's claw honey. The Putnam scale is recorded for the first time in Arizona, having been collected on apricot trees in Salt River Valley, and also reported to occur on peach and plum trees.

Insects of Indiana for 1925, J. J. DAVIS (*Ind. Acad. Sci. Proc., 41 (1925), pp. 303–319, figs. 7*).—This is a discussion of the status of economic insects in Indiana in 1925 arranged according to the crops and products attacked.

[**Work with economic insects in Wisconsin**] (*Wisconsin Sta. Bul. 388 (1926), pp. 60–75, figs. 10*).—Reference is first made to successful poison bait control work by A. A. Granovsky and J. Johnson of grasshoppers attacking tobacco. It is pointed out that seed bed injury by flea beetles, etc., can be controlled by dusting with calcium fluosilicate or sodinm silicofluoride without injury to the plants. In work with potatoes at Waupaca, C. L. Fluke and J. E. Dudley found that for insect and disease control Bordeaux spray gave higher yields of potatoes than did the use of dust preparations. Becanse of the ease and speed with which dust applications can be made, their use is said to be rapidly increasing.

The black cherry aphid, which has been observed in the Sturgeon Bay region for a long time, is primarily a pest of the sweet cherry although it occurs on certain sonr varieties and is particularly destructive to the Early Richmond and to a lesser degree the Montmorency varieties. It was observed by Granovsky that the aphid feeds particularly upon the buds and tender foliage, usually on the lower side of the leaves of the terminal shoots, and in the process of feeding discolors the foliage and often causes curling of the leaves. Control experiments have shown dusting to be fairly efficient when the dust consists of 2 pints of Blackleaf 40 to 50 lbs. of hydrated lime. In experimental work in the spring of 1926, the petal spray appeared to be the best for control of the pest and the new insecticide Derrisol seemed to be particularly effective. Studies made of the life history of this aphid are briefly reported upon. The wild pepper grass, *Lepidium* sp., was found, late in 1926, to be the secondary host of the species.

An outbreak in 1926 of the hemlock spanworm (*Ellopia fiscellaris* Gn.), which occurred in the Peninsular State Park in Door County, was combated under the direction of S. B. Fracker and Granovsky by the application of calcium arsenate dnst by airplane, 15,000 lbs. of calcium arsenate being distributed over about 1,000 acres of infested forest. Quite effective results were obtained, the mortality being estimated at 90 per cent in hemlock forests and over 80 per ceut in the mixed forest areas. Referring to the life history of the spanworm, it is pointed out that eggs deposited on the needles and bark of hemlock trees in the fall, usually in late September, hatch about the middle of the following June and the worms reach maturity in August. About 90 per cent of the trees attacked by this pest die and those that recover are iu a very weak condition.

Control work with grasshoppers in Door County by Granovsky is reported upon, an account of which, from another source, has been noted (E. S. R., 55, p. 355). In this work a mixture of sawdust, salt, and poison was found to be wholly satisfactory and quite materially reduced the expense.

It was found that under Peninsular region conditions early seeding of winter wheat tends to reduce injury from the Hession fly as well as that from winter-killing.

Observations by Fluke upon parasitic control of the pea aphids by parasites and predators are referred to. Preliminary tests at Waupaca indicate that calcium fluosilicate gives considerable promise in the control of chewing insects, being fairly effective against the Colorado potato beetle. Reference is made to the thistle butterfly (*Vanessa cardui* L.), which is commonly met with in the State. Studies made of the transmission of mosaic disease by leafhoppers by Granovsky are referred to. In transmission work needle inoculation with crushed leafhoppers produced symptoms of disease on the apple leaf. Observations of Granovsky and F. R. Jones indicate that alfalfa yellows is caused by leafhopper injury, *Empoasca fabae* Harris being the species responsible.

[Annual reports of the Government entomologists of the Gold Coast for the year 1925–26], W. H. Patterson and G. S. Cotterell (*Gold Coast Agr. Dept. Rpt. 1925–26, pp. 36–39*).—These brief reports deal with the more important insect enemies of the year, particular attention being given to the termites attacking cacao and buildings and means for their control. Reference is made to injury caused to ripe bananas by fruit-piercing moths, *Achrea* spp. and *Ophideris fullonica*. Injury was caused on one plantation by the coconut scale (*Aspidiotus destructor*), the combat of which through the application of a spray was suspended due to the appearance of the ladybeetle *Chilocorus schiodtii* Muls. in large numbers. The ladybeetle was also the chief means of control of the coconut scale in another district. The leafhopper *Erythroneura* (*Typhocyba*) sp. was found to cause damage similar to that of the scale insect, but was held fairly well under control by natural enemies.

Annual report of the Government entomologist, H. Hargreaves (*Uganda Dept Agr. Ann. Rpt. 1924, pp. 21–28*).—This is a report of the more important insects of the year 1924.

Annual report of the assistant entomologist, G. L. R. Hancock (*Uganda Dept. Agr. Ann. Rpt. 1925, pp. 25–28*).—The more important insects of 1925 are dealt with.

Insect enemies of cotton in French West Africa, P. Vayssière and J. Mimeur (*Les Insectes Nuisibles au Cotonnier en Afrique Occidentale Française. Paris: Émile Larose, 1926, pp. IX+176, pls. 22, figs. 11*).—This is an account of the more important enemies of cotton in French West Africa, together with their important insect parasites and predators. Accounts (1) of the pink boll worm and its destruction in the seed and (2) of insect pests in French West Africa of crops other than cotton are appended. A bibliography of eight pages is included.

A list of the insects affecting sugar cane in Cuba, D. L. Van Dine (*Trop. Plant Research Found. [Wash., D. C.] Bul. 3 (1926), pp. 16*).—The author presents a preliminary annotated list of 48 insects affecting sugar cane in Cuba. A list of 33 references to the literature is included.

Insect pests of our garden plants and their control, C. A. Weigel (*Amer. Hort. Soc. Bul. 3 (1926), pp. 12*).—This is a practical account.

Pollination in orchards.—VII, Insect visitors to fruit blossoms, G. F. Wilson (*Jour. Roy. Hort. Soc., 51 (1926), No. 2, pp. 225–251, pls. 6*).—This portion of the series previously noted (E. S. R., 46, p. 840) is an extended account of observations of insect pollination of blossoms, including a tabulated census of the chief pollinating agents of fruit trees at Wisley, Surrey, from 1920 to 1924, inclusive. The observations reported show that the insect pollination is by no means confined to the honey bee.

Insects caught in light traps, F. V. THEOBALD (*Jour. Roy. Hort. Soc., 51 (1926), No. 2, pp. 314–323, pls. 2*).—This is a report of collections made by light traps, details of which are given, including the number of insects caught, the percentage of males and females, a list of the species of economic importance, and a list of the chief insects of noneconomic importance.

The results of two years' work show that much is accomplished by light traps in the destruction of tortricids, and that for this purpose they may be safely recommended for use in plantations infested with such pests. However, they supplement and should not displace the protection afforded by spraying. It is pointed out that when loganberries become infested with the shoot moth the traps might well be employed, since spraying does not control the pest and the moths are much attracted by light.

An important Queensland insect pest, R. VEITCH (*Queensland Agr. Jour., 26 (1926), No. 5, pp. 385, 386, fig. 1*).—A small bug belonging to the genus Nysius, family Lygaeidae, is responsible for serious losses in Queensland. It is said to occur in enormous numbers in many fields and orchards, and the combined effect of its feeding is exercising a serious adverse influence on the plants attacked. When field crops are infested the leaves wilt and frequently die, and the yield of the crop is seriously reduced. When the outbreak is in an orchard many of the young attacked fruits fall to the ground, and of those that remain on the trees many are blemished. The bug has been found attacking many plants, among them potatoes, tomatoes, peaches, cherries, mangoes, grapes, and cotton.

Irritation due to insect secretion, W. A. HOFFMAN (*Jour. Amer. Med. Assoc., 88 (1927), No. 3, pp. 145, 146, figs. 2*).—Following a brief discussion of the subject, the author reports upon a case of irritation personally experienced at Port au Prince, Haiti, caused by the pentatomid bug *Loxa flavicollis*. Experiments made with other individuals of this bug are also briefly reported upon.

A preliminary study of the life-history and habits of Sahlbergella singularis Hagl. and Sahlbergella theobroma Dist., attacking cocoa on the Gold Coast, with suggested control measures, G. S. COTTERELL (*Gold Coast Dept. Agr. Bul. 3 (1926), pp. 26, pls. 8*).—This paper deals with the life history and habits of the two most destructive pests of cacao on the Gold Coast, with suggested control measures. The importance of the cocoa industry is discussed, attention being called to the fact that the Gold Coast is the leading exporting country.

Studies on chemical changes during the life cycle of the tent caterpillar (Malacosoma americana Fab.), I, II, W. RUDOLFS (*Jour. N. Y. Ent. Soc., 34 (1926), Nos. 3, pp. 249–256, figs. 2; 4, pp. 319–330, figs. 2*).—Two parts are given.

I. *Moisture and fat.*—Chemical analyses made at the New Jersey Experiment Stations on the tent caterpillar during its life cycle indicated that the moisture content decreased gradually in the egg masses, increased rapidly in the young growing caterpillar (first two instars), remained constant until they were full grown, and decreased again rapidly from the time they were ready for pupation until the adults emerged. Moisture was lowest at the time of hatching (39.4 per cent) and highest during third to fifth instars, namely 83–85 per cent. Ether soluble material (fats) decreased fairly rapidly in the eggs after deposition, decreased slowly until the larvae hatched, increased gradually during the first two instars, increased rapidly during the next three instars, and increased at an accelerated rate during the first part of metamorphoses, while it decreased during the second part. Fat calculated on a dry basis was lowest upon hatching (0.66 per cent) and highest when larvae had just pupated (28.8 per cent). The relation between moisture and fatty substances during the life cycle is graphically shown.

II. *Nitrogen and its relation to moisture and fat.*—Analyses of egg masses, larvae, pupae, and adults of the tent caterpillar showed that the total nitrogen content of the egg masses from the time they were deposited to the hatching of the young larvae averaged 13 per cent. "There was an initial increase, followed by a decrease and again followed by an increase. The average nitrogen content of the growing larvae was about 10.2 per cent, decreasing from the time of hatching to the last instar. Nitrogen decreased considerably from the time the larvae were full grown until the larvae had 'just pupated (prepupal stage), while it increased during the chrysalis stage. Adults again contained less nitrogen than the pupa in the last stage. The relation between nitrogen and moisture and nitrogen and fatty substances is shown."

Results of some experiments carried out at the Blackwood Experimental Orchard for the control of codlin moth, R. FOWLER (*Jour. Dept. Agr. So. Aust., 30 (1926), No. 3, pp. 240–251, fig. 1*).—This is an account of experiments conducted in 1925–26 at the State Experimental Orchard at Blackwood with a view to discovering more effective methods of control. Much of the data is presented in tabular and graph form.

An infectious disease fatal to the larvae of the wax moth [trans. title], V. CHORINE (*Compt. Rend. Soc. Biol.* [*Paris*], *95 (1926), No. 22, pp. 199–201; abs. in Rev. Appl. Ent., 14 (1926), Ser. B, No. 10, p. 169*).—The author has isolated two organisms from diseased wax moth larvae. The first, which is virulent to the larvae, he has named *Bacterium galleriae*, and the other, which is somewhat pathogenic to the larvae, *Streptococcus galleriae*.

Lyonetia clerckella L. in Sweden, its biology and control [trans. title], N. A. KEMNER (*Meddel. Centralanst. Försöksv. Jordbruksområdet* [*Sweden*], *No. 301 (1926), pp. 59, figs. 14; Eng. abs., pp. 55–57*).—This is an account of an apple leaf miner that sometimes occurs in Sweden in such numbers as to cause injury to, and even to entirely destroy, the leaves.

The bronzed cutworm (Nephelodes emmedonia Cramer) (Lepidoptera), S. E. CRUMB (*Ent. Soc. Wash. Proc., 28 (1926), No. 9, pp. 201–207, figs. 7*).—In this paper the author describes the mature larva of the bronzed cutworm rather fully as a contribution toward a classification of noctuid larvae. Notes on distribution and seasonal history are included.

Some hints on the preparation and study of genitalia, W. H. T. TAMS (*Ent. Rec. and Jour. Variation, 38 (1926), No. 11, pp. 145–149, pl. 1*).—Directions are given for the study of the anatomy of genitalia of the Lepidoptera.

Experiments in poisoning the cane borer with sodium fluosilicate, T. E. HOLLOWAY, W. E. HALEY, and J. W. INGRAM (*Planter and Sugar Manfr., 77 (1926), No. 22, p. 431*).—The work at the Louisiana Experiment Station previously noted (E. S. R., 55, p. 455) led to tests by the U. S. D. A. Bureau of Entomology, a summary of which is given in this brief statement. Sodium fluosilicate was dusted with hand dust guns on sugar cane plants in Louisiana with negative results.

The gall midges of vegetables and market garden crops, H. F. BARNES (*Jour. Roy. Hort. Soc., 51 (1926), No. 2, pp. 331–336, pls. 4*).—This account deals with the gall midges attacking crucifers, peas, mushrooms, vegetable marrows, and parsnips.

Summary of results of field trials by the U. S. Bureau of Animal Industry on ox-warble control, M. IMES (*Jour. Parasitol., 13 (1926), No. 1, pp. 42–46*).—The author has found that the arsenical dip is not a satisfactory remedy to control or eradicate ox-warble flies, and that repeated dipping in any of the known cattle dips limits or reduces infestation but does not eradicate the fly. Treatment of cattle during the fly season in wading vats charged

with a 2 per cent solution of coal tar-creosote dip or processed crude petroleum or similar oils prevents gross infestation but does not effect complete eradication. The wading-vat method of applying fly repellents or insecticides to the legs of cattle is practical and economical for use on farms, and it can successfully be adapted to range use when watering places can be fenced. Processed crude petroleum or similar oils and a 2 per cent solution of coal tar-creosote dip are the most effective of the medicaments used in the field trials.

The occurrence of Cuterebra (Diptera, Oestridae) in western Canada, A. E. CAMERON (*Parasitology, 18 (1926), No. 4, pp. 430–435, fig. 1*).—This is a brief account of the occurrence of oestrids of the genus Cuterebra in western Canada, together with a description of larvae taken in several localities.

Notes on the life history of Oedemagena tarandi L. and Cephenomyia trompe Modeer, S. HADWEN (*Jour. Parasitol., 13 (1926), No. 1, pp. 56–65, figs. 2*).—The author finds that the fly is on the wing from June to September, but that reindeer are not so heavily parasitized with *C. trompe* as they are with *O. tarandi*. *C. trompe* can make long flights, and when depositing its larvae causes more fear than *O. tarandi*, but few animals in a herd are attacked at one time owing to the lesser number of flies.

A destructive potato beetle (*Farming in So. Africa, 1 (1926), No. 7, p. 250*).—This is an account of a native ladybird beetle, *Epilachna dregei*.

On some Coccinellidae of the tribe Telsimiini, with descriptions of new species, E. A. CHAPIN (*Biol. Soc. Wash. Proc., 39 (1926), pp. 129–133*).—One of the two species here described as new is *Telsimia nitida* from the island of Guam, where it feeds extensively on the coconut scale (*Aspidiotus destructor*). The other species, described as *T. emarginata*, originally from Foochow, China, has been introduced into California as an enemy of diaspine scales infesting citrus fruits.

The natural history of ants, R. A. F. DE RÉAUMUR, trans. and annotated by W. M. WHEELER (*New York and London: Alfred A. Knopf, 1926, pp. XVII+280, pls. 4*).—In this volume Wheeler reproduces Réaumur's unpublished manuscript on ants, written about the year 1742. Following an introduction (pp. XI–XVII), the life and work of Réaumur are considered (pp. 3–40), followed by the original text of the Histoire des Fourmis (pp. 43–128), a translation (pp. 131–217), annotations (pp. 221–262), a list of Réaumur's works (pp. 263–274), and an index (pp. 275–280). This unpublished manuscript, found by Wheeler in the archives of the Academy of Sciences of Paris in the spring of 1925, is considered by him to be even in its unfinished form the most important myrmecological document of the eighteenth century.

The origin of mixed broods in polyembryonic Hymenoptera, R. W. LEIBY (*Ann. Ent. Soc. Amer., 19 (1926), No. 3, pp. 290–299*).—From the author's studies he now considers it safe to conclude that insemination or lack of it by fertilized females is controlled in the polyembryonic Hymenoptera thus far studied. Since only males are produced from unfertilized eggs, and since the species can obviously be continued only by the production of females, the control of insemination would be, and is, of advantage to the adult parasites of a brood.

Experiments in rearing colonies of bumblebees (Bremidae) in artificial nests, T. H. FRISON (*Biol. Bul. Mar. Biol. Lab., Woods Hole, 52 (1927), No. 1, pp. 51–67, figs. 4*).—In the studies conducted the author found it possible to induce the queens of certain species of North American bumblebees to start colonies in confinement when either one or two queens were used. In 1919 and 1920, an average success of over 70 per cent was attained in starting colonies under controlled conditions. It is pointed out that normal colonies of

bumblebees were obtained for the first time by confining in an artificial nest a single queen unaided by introduced workers. Attention is called to an account of experiments by Plath (E. S. R., 50, p. 259), who achieved similar results in 1922 by the confinement of a single queen assisted by from one to three workers. A bibliography of 14 titles is included.

Intensive apiculture and the rearing of queen bees, A. PERRET-MAISONNEUVE (*L'Apiculture Intensive et l'Élevage des Reines. Paris: Maurice-Mendel, 1926, 3. ed., pp. XXIV+550, pl. 1, figs. 88*).—This is a third edition of the work previously noted (E. S. R., 50, p. 158).

The present position regarding adult bee disease is Great Britain, A. M. STURGES (*Bee World, 8 (1926), No. 6, pp. 82–86*).—This is a paper presented at the convention of the Apis Club held in July, 1926.

Four new species of parasites from aphidophagous Syrphidae (Hymenoptera), M. KAMAL (*Canad. Ent., 58 (1926), No. 11, pp. 283–286*).—The parasites here described as new, all from California, include an encyrtid, a chalcidid, and two ceraphromids.

A new case of phoresie: Trichogrammidae on Orthoptera [trans. title], C. FERRIÈRE (*Treubia [Batavia], 8 (1926), No. 3–4, pp. 274–278, pl. 1, figs. 2*).—The author reports receipt of a number of grasshoppers collected by E. Jacobson at Samarang and Batavia in Java, which carried small hymenopterous parasites on their lower wings. These chalcidid parasites belong to the family Trichogrammidae, or egg parasites, which it is thought probable were being transported by the grasshoppers awaiting the deposition of eggs by their host. It is pointed out that this is the first case of phoresie known involving the Trichogrammidae and also the first trichogrammid parasite of Orthoptera to be recorded. The species is described as new under the name *Oligosita xiphidii*.

Description of a new braconid parasite of Artona catoxantha (Hymenoptera), S. A. ROHWER (*Ent. Soc. Wash. Proc., 28 (1926), No. 8, pp. 188, 189*).—Under the name *Apanteles artonae* n. sp., the author describes a parasite of the early stages of the coconut pest *Artona catoxantha* Hamp., at Kuala Lumpur, Federated Malay States.

Observations on scorpions, F. R. SMITH (*Science, 65 (1927), No. 1673, p. 64*).—The author refers briefly to observations made of *Centruroides vittatus* Say in Arkansas. Each young scorpion was observed to be born in a very thin and transparent envelope, from which it freed itself in about 15 minutes. Molting took place in from 3 to 6 days and the young remained on the mother's back for from 5 to 15 days. It was thought that this scorpion probably attains maturity in 3 or 4 years.

The life history and biology of the tree-toad chigger, Trombicula hylae Ewing, H. E. EWING (*Ann. Ent. Soc. Amer., 19 (1926), No. 3, pp. 261–267, figs. 4*).—The author records *T. hylae* from the tree toad, *Hyla arenicolor*, in California. This is believed to be the first time that nymphs and adults have been reared from a parasitic mite larva obtained from an amphibian host.

Redescription of Taenia krabbei Moniez, E. B. CRAM (*Jour. Parasitol., 13 (1926), No. 1, pp. 34–41, figs. 8*).—A complete description is given of this parasite from Iceland and Alaska, the primary host of which is the domestic cat, the secondary host the reindeer.

ANIMAL PRODUCTION

The breeding and improvement of farm animals, V. A. RICE (*New York and London: McGraw-Hill Book Co., 1926, pp. XIV+362, figs. 113*).—The principles of animal breeding are presented with reference to the underlying laws

of genetics. There are taken up in different portions of the book the fundamentals of reproduction, Mendelism, the physical basis of heredity, sex determination, methods of breeding, biometry, breed analyses, and the inheritance of characters in farm animals.

Twin and multiple births in our domestic mammals [trans. title], J. RICHTER (*Arb. Deut. Gesell. Züchtungsk., No. 29 (1926), pp. 119, figs. 2*).—Based on records of various breeds of horses, cattle, sheep, goats, and swine, the author has studied the relative occurrence of multiple births and related conditions. The rate of breeding and the number of young per birth showed much variability in the different types of animals and in the different breeds of each type. The larger numbers of young at birth and the more regular breeding of goats and swine are considered as due to the long-continued selection of breeding animals for fertility.

Feeding and handling livestock to prevent shrinkage and loss, P. GERLAUGH (*Ohio Agr. Col. Ext. Bul., 21 (1925–26), No. 7, pp. 8, figs. 5*).—Brief suggestions are given for the prevention of losses in shipping livestock, with special reference to hogs, which suffer particularly from overfeeding in warm weather.

The origin and quality of commercial livestock marketed in Canada in 1925, H. S. ARKELL (*Canada Dept. Agr., Livestock Branch Rpt. 6 (1926), pp. 58, figs. 3*).—This publication deals with the origin and quality of livestock marketed in Canada during 1925, and is similar to the previous report (E. S. R., 54, p. 466.)

Diet and body fat, L. B. MENDEL and W. E. ANDERSON (*Science, 64 (1926), No. 1659, pp. 384–386, figs. 2*).—In continuing the studies of the deposition of soft vegetable fats in rats (E. S. R., 52, p. 109), a ration composed of dried skim milk and soy bean oil or peanut oil has been fed until average body weights of 250 and 175 gm. were attained on the rations with soy bean oil and peanut oil, respectively. Following the feeding of these rations the individuals were starved until the losses in weight varied from 23 to 27 per cent of the body weight. The fat was then hardened on a ration of starch until weights of approximately 275 and 225 gm., respectively, were attained on the two rations.

The results showed that the process of starvation largely removed the soft oily fats produced on the diets containing soy bean or peanut oils, and that the starch feeding produced a hardened fat. Individuals not subjected to the starvation period would have required a much longer feeding period on the carbohydrate feed to produce a fat of equal hardness than those which were first starved. It is also pointed out that the feed required for recovery after the starvation period was very low in proportion to the gains made, and that in the peanut oil lot the food intake of the starch diet was less than with the nonstarved group.

The composition of swedes, A. LAUDER (*Scot. Jour. Agr., 9 (1926), No. 2, pp. 160–167, figs. 3*).—The dry matter content as well as the percentage of soluble and insoluble solids of ten different varieties of swedes grown at Aberdeen, Edinburgh, and Glasgow have shown distinct differences, which are attributed to the locality and climate, and to the variety grown.

Silage investigations (*Wisconsin Sta. Bul. 388 (1926), p. 92*).—A new type of silage rot was found at the station, which upon examination showed no mold growth. The silage was hot, dark in color, offensive in odor, and moist and slimy to the touch. The rot is due to a bacterium which destroys the acid and is not checked by the by-products formed by the silage. Growth occurs rather rapidly even during the winter. No remedial measures have yet been

found, but cleaning and painting the walls of the silo with hot tar are recommended.

Eliminating the toxicity of cottonseed meal, W. D. Gallup (*Jour. Dairy Sci., 9 (1926), No. 4, pp. 359–372*).—In continuing the studies of Dowell and Menaul at the Oklahoma Experiment Station (E. S. R., 50, p. 468), cottonseed meal autoclaved or steamed for 1 hour and untreated meal in combination with other grains were fed to different lots of 3 pigs each at the rate of 1.3 lbs. of the cottonseed meal per 100 lbs. of body weight during a 75-day test. A check lot of inferior animals received tankage. The pigs receiving the steamed and autoclaved meal were in the best of condition throughout the test and always ate their feed with a relish, while the untreated meal was eaten only sparingly. The total gains per pig in the different lots were with steamed meal 26 lbs., autoclaved meal 22 lbs., and untreated meal 13 lbs.

In further studies of the effect of treatment on the toxicity of cottonseed, 2 feeding experiments were conducted with rats. The 4 lots of 4 individuals each used in the first experiment received rations containing 50 per cent of wheat and 35 per cent of untreated cottonseeds, 35 per cent of cottonseeds soaked for 4 hours and autoclaved for 1 or 2 hours, or 25 per cent of cottonseeds extracted with ethyl ether plus 10 per cent of commercial cottonseed oil. All rats receiving the ration containing untreated seeds were in poor condition during the latter part of the 9 weeks' experimental period, but the other lots made normal gains and produced normal young.

To further study the effect of cooking, lots of 4 rats received a ration composed mainly of 58 per cent of wheat plus 35 per cent of cottonseed meal steamed for 1 hour, or 35 per cent of untreated cottonseed meal. A third lot received 25 per cent of untreated meal in the ration. Slow growth and poor condition accompanied the feeding of the ration containing 35 per cent of untreated cottonseed meal, but 25 per cent did not show toxic effects in the 7 weeks' experiment. Steamed meal, however, produced much better gains.

The author concludes from these experiments that untreated cottonseed meal is quite toxic when fed in too large amounts or to young animals, but that the toxicity is overcome by autoclaving for 1 hour at 20 lbs. pressure or by cooking with steam for 1 hour.

[Feeding experiments with beef cattle at the Wisconsin Station] (*Wisconsin Sta. Bul. 388 (1926), pp. 129, 130, 132*).—Results of experiments are noted.

Chopping alfalfa hay for beef cows.—In work by J. G. Fuller and E. Arneson feeding beef cows with nursing calves by the reversal method for two periods of 63 days each showed a slight increase in favor of chopped hay. Cows on uncut hay gained 0.17 lb. per head daily and those on cut hay 0.38 lb. daily. There was no difference in the gains of the calves. In this experiment there was a saving of 10 per cent of the concentrates when cut hay was fed.

Cottonseed and linseed meal for fattening steers.—The results of one experiment by F. B. Morrison and B. H. Roche showed that calves receiving a protein supplement of half cottonseed meal and half linseed meal made practically identical gains with calves receiving linseed meal alone. It was calculated that the mixture was worth more than the linseed meal alone.

Rhodes grass hay versus alfalfa hay as feed for cattle, R. H. Williams, R. H. Burns, and C. A. Smith (*Arizona Sta. Rpt. 1923, pp. 466, 467*).—Two 2-year-old Hereford heifers fed Rhodes grass hay consumed 13 lbs. daily and gained 0.39 lb., while a similar lot fed alfalfa hay consumed 15 lbs. per day and gained 1.67 lbs. In a second test in which two lots of two Hereford cows and their 8-months-old calves were fed hay and a limited amount of silage,

40 lbs. to the lot, those fed alfalfa consumed 27 lbs. of hay per day as against 19 lbs. for those fed Rhodes grass hay. In the first lot the cows gained an average of 2.33 lbs. daily and the calves 1.99 lbs., while in the second lot the cows lost slightly in weight and the calves gained 1.21 lbs. daily.

The cattle of the world, A. H. SANDERS (*Washington, D. C.: Natl. Geogr. Soc., 1926, pp. [4]+142, illus. 114*).—A reprint of the article previously noted (E. S. R., 55, p. 58), with a supplement on the propagation of domestic cattle.

Morphological investigation of German bred Shorthorn cattle [trans. title], J. VON RÜMKER (*Landw. Jahrb., 64 (1926), No. 1, pp. 1–39, fig 1*).—This consists of a statistical study of various body measurements of several gronps of Shorthorn cattle bred in Germany.

The Bhagnari breed of cattle in Sind and Baluchistan, H. G. BALUCH (*Bombay Dept. Agr. Bul. 126 (1925), pp. 16, pls. 6*).—A description of this little known breed of cattle.

Rutabagas vs. corn silage for breeding ewes (*Wisconsin Sta. Bul. 388 (1926), p. 133*).—In work by F. B. Morrison and F. Kleinheinz, 20 Shropshire ewes were divided into two lots. One lot was fed 2 lbs. of silage and 3 lbs. of hay daily. The other lot received 3.2 lbs. of rutabagas and 3.3 lbs. of hay. The larger allowance of feed in the second lot was made to keep both lots in abont the same condition. For about a month before lambing both lots were fed 0.5 lb. of a grain mixture per day. The ewes fed rutabagas made slightly less gain and produced lambs that were less thrifty at birth than those fed silage.

Various methods of docking lambs, R. H. WILLIAMS, R. H. BURNS, and C. A. SMITH (*Arizona Sta. Rpt. 1923, pp. 470, 471*).—The results of an experiment to determine the most satisfactory method of docking lambs are briefly reported, but no conclusions are drawn.

Sheep raising in central Alberta and a comparison of six breeds, F. H. REED and L. T. CHAPMAN (*Canada Dept. Agr. Bul. 68, n. ser. (1926), pp. 15, figs. 6*).—This publication contains an account of the comparative improvement through grading up a flock of 400 common range ewes of western Canada by the use of purebred Shropshire, Hampshire, Oxford, Cheviot, Corriedale, and Leicester rams from 1917 to 1925. The results showed that ewes could be rapidly improved by several successive generations of matings with purebred rams of any of the breeds.

The breeds were rated differently as to their ability to fix breed characteristics, live weight, quality and weight of the fleeces, lambing percentages, and mortality, weights, and dressing percentages of the lambs, bnt for general utility purposes they were rated in the order as given above. The Cheviots were criticized for nervousness, Leicesters for open fleeces, and Corriedales for being slow in their ability to obtain feed.

In feeding experiments lowland hay proved decidedly superior to oat green feed for fattening ewes. The results of a comparison of eight roughages when fed with oats to shearling wethers showed that the largest average daily gain per head, 0.35 lb., was made with cut oat green feed, followed closely by 0.34 lb. with upland hay. The smallest amount of roughage, 878 lbs., was required per 100 lbs. of gain by the lot receiving the npland hay. The smallest average daily gain per head, 0.10 lb., occurred in the lot receiving lowland hay, but one lot receiving cut oat green feed without the snpplementary feeding of oat grain made an average daily gain of only 0.08 lb.

In another experiment with 6 lots of lambs there were produced with whole oats an average daily gain of 0.32 lb.; whole barley, 0.29 lb.; barley and oats, 0.28 lb.; screenings and oat chop, 0.24 lb.; oil cake meal, 0.23 lb.; and screenings

and bran, 0.21 lb. These were fed as the grain portion of a ration including alfalfa, oat green feed, and lowland hay.

Development of breeds of coarse-wooled sheep in Russia, N. P. CHIRVINSKY and V. B. ELAGIN (*Razvodimyĭa v Rossii Porody Grubosherstnykh Ovets. Kief: Kievsk. Politekhnich. Inst. Imp. Aleksandra II, 1916, pp. XV+133+96*).—Detailed descriptions are given of the character, adaptation, distribution, and general economic value of the coarse-wooled sheep in Russia. The breeds are grouped as coarse wooled, long wooled, Kurdian, and fat-tailed sheep and are discussed with reference to their development and to their importance in the different localities, regions, and governments.

Development of breeds of coarse-wooled sheep in Russia [N. P. CHIRVINSKY and V. B. ELAGIN (*Prilozhenie k Knigĭe: Razvodimyĭa v Rossii Porody Grubosherstnykh Ovets. Kief: [Kievsk. Politekhnich. Inst. Imp. Aleksandra II], 1916, pls. 17; insert (legends), pp. 8*).—A collection of 111 figures illustrating breed characteristics, wool texture and quality, and pelt value, published as a supplement to the work noted above.

Skeletal development in sheep, N. P. CHIRVINSKY (*Razvitie Kostĭaka u Ovets. Kief: Kievsk. Politekhnich. Inst. Imp. Aleksandra II, 1909, pp. VII+304, pls. 13*).—This book, an anatomical treatise on the development of the skeleton in sheep, devotes chapters to the conformation and development of the skull, spinal column, ribs, sternum, scapula, long bones, and other parts of the skeleton, and discusses the relation of sex, age, feeding or the plane of nutrition, castration, environment, and other factors to the growth and structure of these parts. Special attention is given to the effects of normal and insufficient nourishment at different ages. The comparative size and conformation of different parts of the skeleton are illustrated in 103 figures.

The goat: Breeds, breeding, and exploitation, [E.] HUART DU PLESSIS (*La Chèvre: Races, Élevage, Exploitation. Paris: Libr. Agr. Maison Rustique, 1926, pp. 156, figs. 45*).—This reference book deals with the breeds, management, housing, and breeding of goats, and includes chapters on the milk, cheese, and meat of the goat.

Hog-feeding investigations, R. H. WILLIAMS, R. H. BURNS, and C. A. SMITH (*Arizona Sta. Rpt. 1923, pp. 467–470*).—The results of the following experiments are briefly noted:

Vitamins for pigs.—This is a continuation of work previously reported (E. S. R., 53, p. 773) of 2 gilts on a restricted diet of ground hegari and tankage. One gilt was removed at the end of about 290 days. The other gilt was maintained on the same ration for about 500 days, at which time she weighed 469 lbs., had failed to conceive, had become blind, and showed evidence of nutritional deficiency. After being on alfalfa pasture for a short time she became healthy and thrifty and later conceived.

Ground yellow corn v. a mixture of ground yellow corn and 10 per cent tankage.—One lot of 8 pigs self-fed ground yellow corn weighed less than 150 lbs. after 17 weeks of feeding. A similar lot of 7 pigs self-fed ground yellow corn 90 per cent and tankage 10 per cent averaged 208 lbs. in the same length of time. It was doubtful whether any of the pigs fed corn alone would have ever reached market weight.

Fattening hogs on garbage.—A lot of 7 pigs, averaging 133 lbs., fed all the garbage they would consume, ate 17.92 lbs. per day and gained an average of 2.12 lbs. daily. It required 844 lbs. of garbage to produce 100 lbs. of gain, and the calculated value of the garbage was $22.51 per ton. Another lot of six 40-lb. pigs ate 14.39 lbs. of garbage per day and averaged 1.54 lbs. daily gain. These pigs required 936 lbs. of garbage to produce 100 lbs. of gain, and the

garbage was calculated to be worth $19.23 per ton. The average dressing percentages were 74.61 and 80 in lots 1 and 2, respectively.

Ground hegari v. ground yellow corn.—Two lots of 7 pigs each averaging 56 lbs. were selected to compare the feeding value of ground hegari and ground yellow corn when fed with tankage. The lot receiving corn and tankage gained an average of 1.28 lbs. per day for a period of 17 weeks, and required 408 lbs. of feed to produce 100 lbs. gain. The lot receiving hegari and tankage gained 1.9 lbs. per day over a period of 20 weeks, but required 458 lbs. of feed to produce 100 lbs. gain. All of the pigs in the first lot were in marketable condition at the end of 17 weeks, while only 3 in lot 2 had reached a desirable finish at the end of 20 weeks. At least 2 of the pigs fed hegari were totally deaf and blind and several had nervous spasms, apparently due to a vitamin deficiency. All of the pigs fed on corn were healthy and vigorous.

Sex as a factor in fattening pigs.—On a ration of cracked hegari self-fed, alfalfa pasture, and about 7 per cent skim milk, boars made an average daily gain of 1.64 lbs., and a mixed lot of barrows and gilts 1.6 lbs. The barrows in this last lot gained 37 per cent more than did the gilts. The boar pigs required 24 per cent more hegari and 2 per cent more skim milk to make the same gain than did the mixed lot of barrows and gilts. The mixed lot returned 23 per cent more profit than did the boars.

Two methods of growing gilts and maintaining brood sows.—A study was begun in 1919 of the effect of abundant and limited feeding upon the development of five gilts. Three gilts that were full fed became barren and were sold. Of the 2 gilts that had had a limited feed one also proved barren, while the other gilt has twice farrowed normal litters and raised an average number of pigs.

[Swine feeding experiments at the Wisconsin Station] (*Wisconsin Sta. Bul. 388 (1926), pp. 113, 114, 134, 135, figs. 2*).—Results of feeding experiments are noted.

Is ordinary limestone a suitable supplement for swine?—Sows fed floats became stiff and bore dead offspring even when cod-liver oil was added to the ration, perhaps because of an excess of fluorine in the floats. When sows were fed limestone and cod-liver oil reproduction was normal, but the animals developed rickets in the absence of cod-liver oil.

Yeast for pigs.—Several trials by F. B. Morrison, J. M. Fargo, and Thomas with yeast as a part of the ration for swine failed to show any beneficial results, and in several cases pigs without yeast made faster gains. The cost of producing gains was materially greater in the lots that were fed yeast.

Semisolid buttermilk.—The results of three trials by Morrison et al. in which semisolid buttermilk (30 parts of water to 1 part of semisolid buttermilk) was fed showed no improvement in the health of the pigs nor increase in the rate of gain. The cost of 100 lbs. of gain was increased by the use of semisolid buttermilk.

Value of cheese parings.—In work by Morrison et al., pigs fed cheese parings made a gain of 1.04 lbs. per head daily on an average ration of 3.7 lbs. of corn and 1 lb. of cheese parings. The calculated value of cheese parings was $60 per ton. This product should be used within a short time, as mold is apt to set in, which may either prove injurious or decrease the feeding value.

[Experiments with swine at the Central Experimental Farm], G. B. Rothwell (*Canada Expt. Farms, Anim. Husb. Div. Rpt. 1925, pp. 32–55, figs. 3*).—Brief accounts are given of the results of experiments with swine dealing with various substitutes for skim milk in the feeding of weaned pigs, the use of potassium iodide, cod-liver oil, and yeast in the ration of market hogs, the value

of oat clippings, the influence of feeds and methods of feeding on various types of market pigs, the value of alfalfa meal for market hogs, and comparisons of various strains and breeds of swine (E. S. R., 54, p. 861).

The value of fish meal in swine feeding [trans. title], J. C. DE RUYTER DE WILDT (DE RUIJTER DE WILDT) (*Ver. Exploit. Proefzuivelboerderij Hoorn. Verslag 1925, pp. 27–149, figs. 5; Ger. abs., pp. 133–143; Eng. abs., pp. 144–149; also in Dept. Binnenland. Zaken en Landb.* [*Netherlands*], *Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefsta., 31 (1926), pp. 31–153, figs. 5; Ger. abs., pp. 137–147; Eng. abs., pp. 148–153*).—The results of 6 experiments dealing with the value of fish meal as the protein supplement to rations of corn, barley, and whey or skim milk for fattening hogs are reported. All of the pigs received some fresh grass in summer or mangels in winter, and those not including fish meal were supplemented with 10 gm. of calcium phosphate per head daily. The flavor and odor of the boiled and baked meat and the hardness of the fat were determined for individual animals after slaughter.

In the first experiment, which lasted 140 days, the substitution during the second, third, and part of the fourth months of 250 gm. of fish meal daily for an equal amount of barley in a corn, barley, and whey ration was found not to affect the rate of gain, but the slaughter records showed that the pigs receiving fish meal were more fleshy and better proportioned and the meat was of a better quality. The flavor and odor after cooking were normal in both lots and no difference in the hardness of the fat was apparent.

In three further experiments in which corn, barley, and whey were fed for 3 to 4 weeks, followed by 3 to 4 months in which this ration was supplemented with 250 gm. of fish meal daily and finally by 4 weeks or more for finishing without fish meal, it was found that sufficient additional gains were produced by the fish meal to be practically equivalent to the amount of fish meal fed. The quality of the slaughtered carcasses produced with fish meal was equal to or slightly superior to the carcasses of those not receiving the supplement.

In two other experiments the fish meal was continued up to the time of slaughter without evidence of an appreciable effect of such feeding on the flavor or odor of the raw or cooked meat, though it was reported for one experiment that those receiving fish meal were somewhat fatter.

Modern swine husbandry, LORD BLEDISLOE (*Jour. Farmers' Club* [*London*], *1926, pt. 6. pp. 88–98, figs. 4*).—A description of English methods of swine production.

Pig breeders' annual for 1926 (*London: Natl. Pig Breeders' Assoc.* [*1926*], *pp. 17–99, pls. 19*).—This contains several articles of primary interest to the swine producer.

Chopping timothy hay for work horses (*Wisconsin Sta. Bul. 388 (1926), pp. 130, 131*).—In experiments by J. G. Fuller and E. Arneson one horse in each of eight teams was fed chopped hay and the other horse uncut hay. Both lots were fed the same weight of hay, but the concentrate ration was reduced 10 per cent in the chopped hay lot. After eight weeks of such feeding the rations were reversed and continued for another period of eight weeks. During the first period the horses on chopped hay lost 70.2 lbs. per head and those on uncut hay 40 lbs. each. In the second period the horses on chopped hay lost 19.2 lbs. each and those on uncut hay gained 40.4 lbs. per head.

The evolution of the horse, F. B. LOOMIS (*Boston: Marshall Jones Co., 1926, pp. XVI+233, pls. 26, figs. 41*).—In this volume the author attempts to describe in simple terms the story of the evolution of the horse. Chapters are devoted to the Eocene, Oligocene, Miocene, Pliocene, and Pleistocene horses, and the wild horses of to-day.

The ass: Horses used for mule breeding and the mule of Poitou, L. SAUSSEAU (*L'Ane: Les Chevaux Mulassiers et la Mule du Poitou. Paris: Libr. Des Sciences Agricoles, 1925, pp. 342, figs. 32*).—This book deals with the general importance of the ass and mule industry in Poitou and describes the types of asses and horses used and mules produced.

[Poultry experiments at the Wisconsin Station] (*Wisconsin Sta. Bul. 388 (1926), pp. 109–111, 115*).—The results of experiments are briefly noted.

Winter sunshine and egg production.—In work conducted by J. G. Halpin, pullets fed the regular Wisconsin ration and exposed to as much sunlight as possible during the winter of 1924–25 produced as well as those receiving cod-liver oil. During the winter of 1925–26 the best results were obtained by keeping the windows closed and irradiating the birds with ultra-violet light. Cod-liver oil and irradiated corn oil when fed at the rate of 5 per cent of the ration gave satisfactory results. Eggs from groups in which windows were kept closed and no additional treatment provided soon became practically unhatchable. The same was true when irradiated corn oil was fed. It was also evident that the birds could store enough of the sun's rays to protect themselves through part of the winter.

Minerals influence rate of growth of chicks.—Chicks fed the Wisconsin ration of 80 parts of yellow corn, 20 parts of middlings, 5 parts of chick-sized bone meal, 5 parts of chick-sized limestone, 1 part of salt, and free access to skim milk, grew to a weight of 509 gm. in 10 weeks. A similar lot in which the bone meal was left out averaged 486 gm., and a third lot in which limestone was omitted weighed 353 gm. At 19 weeks of age the chicks in the lots averaged 1,107, 903, and 460 gm., respectively.

Sunlight more important in bone building than amount of lime.—In work by E. B. Hart and Halpin to determine the necessity of lime supplements for chicks raised in the sunlight, groups fed a ration of yellow corn, skim milk, and salt were given 1, 2, and 4 per cent of calcium carbonate, respectively, and other groups received similar amounts of bone meal, respectively. Check groups were maintained indoors away from light.

At the end of 5 weeks bones from representatives of each group were analyzed for ash. For those confined indoors the lime content varied from 30 to 34 per cent, while chicks in the open had bones containing from 45 to 46 per cent lime. At the end of 16 weeks the bones of the chicks in the groups in the sunlight contained about 55 per cent ash. None of the chicks kept away from sunlight lived to 15 weeks of age.

Nutrient requirements of growing chicks, F. E. MUSSEHL (*Nebraska Sta. Research Bul. 38 (1926), pp. 19, figs. 11*).—The work herein reported is a summary of data noted previously (E. S. R., 53, p. 273; 54, p. 866) and above.

Corn as a nutrient for growing chicks, F. E. MUSSEHL, R. HILL, and J. A. ROSENBAUM (*Poultry Sci., 5 (1926), No. 6, pp. 281–284, fig. 1*).—In studying the deficiency of corn as a feed for growing chicks at the Nebraska Experiment Station 5 lots of 25 7-day-old Single Comb White Leghorn chicks each were selected for an 8-week test. The basal ration consisted of yellow corn for all lots. One lot received a supplement of quartz grit only, while distilled water was supplied for drinking. The other lots received tap water, and for each 97 parts of feed supplied 3 parts of a mineral mixture composed of bone ash, calcium carbonate, and sodium chloride (60 : 20 : 20) were included. The ration of yellow corn and minerals of 3 of these lots was supplemented with 5 per cent of egg albumin, one lot receiving also 5 per cent of yeast, while another was given green alfalfa twice daily. All birds received direct exposure to sunlight on clear days.

The results of the experiment indicated that yellow corn is deficient in minerals, proteins, and vitamine B, since the best growth was obtained in the lot receiving the yellow corn and mineral ration supplemented with egg albumin and yeast. Practically no growth was obtained in the lots in which the yellow corn was supplemented only with quartz grit or with the mineral mixture.

"Artificial" enzymes and poultry feeding, W. F. Holst (*Poultry Sci., 5 (1926), No. 6, pp. 261–265*).—A review of the literature dealing with the physiological action of enzymes on digestion, with particular reference to poultry.

The nutritional requirement of the chicken.—VI, Does the chicken require vitamin C? E. B. Hart, H. Steenbock, S. Lepkovsky, and J. G. Halpin (*Jour. Biol. Chem., 66 (1925), No. 2, pp. 813–818, fig. 1*).—In continuing this series (E. S. R., 55, p. 867), the vitamin C content of the livers of chickens which had been fed from November 29 to February 11 on a ration of yellow corn, wheat middlings, raw bone, pearl grit, salt, and autoclaved skim milk plus ultra-violet light was determined by feeding 1 and 3 gm. daily of the livers to scorbutic guinea pigs. The guinea pigs receiving 1 gm. daily of such chicken liver showed some improvement but not complete recovery, though 3 gm. daily effected complete recovery.

Because of the possibility of the chickens accumulating vitamin C in their livers from small amounts present in the grain, the experiment was repeated, using a purified diet of dextrin, casein, yeast, salt, agar, and cod-liver oil. After 84 days of feeding this ration, on which poor growth was made, 1- and 3-gm. amounts of the livers were fed to scorbutic guinea pigs. Three gm. of the liver again cured scurvy, but 1 gm. daily did not supply sufficient amounts of vitamin C though some improvement followed its administration. Evidently the chicken does not require the precence of vitamin C in its diet.

The relation between the amount of ultra-violet light received by hens and the amount of antirachitic vitamin in the eggs produced, J. S. Hughes, L. F. Payne, R. W. Titus, and J. M. Moore (*Jour. Biol. Chem., 66 (1925), No. 2, pp. 595–600*).—A more complete account of experiments the results of which were previously noted (E. S. R., 55, p. 266).

The 1927 New Jersey chick ration and method of chick feeding, F. H. T. Clickner (*New Jersey Stas. Hints to Poultrymen, 15 (1927), No. 5, pp. 4, fig. 1*).—A chick ration is recommended for New Jersey poultrymen. The purpose of the ingredients of the ration, methods of brooding, and general management are included in the discussion.

Egg production, monthly costs, and receipts on New Jersey poultry farms, November, 1925–October, 1926, W. H. Allen (*New Jersey Stas. Hints to Poultrymen, 15 (1927), No. 4, pp. 4, fig. 1*).—This is a report for the period extending from November, 1925, to October, 1926. The data are a compilation from records of 28 poultry farms representing every poultry section of New Jersey.

Broiler production, R. B. Thompson and R. Penquite (*Arizona Sta. Rpt. 1923, pp. 508–510*).—In two experiments in the feeding of broilers the basis of the ration fed was ground milo 2 lbs., shorts 1 lb., and water 8 lbs. To this basic ration was added in lot 1 1 lb. of ground oats, lot 3 1 lb. of alfalfa meal, and lot 5 1 lb. of cottonseed meal. In lots 2, 4, and 6, 1 lb. of semisolid buttermilk mixed with 7 lbs. of water was substituted for the 8 lbs. of water. Otherwise the rations were the same as in lots 1, 3, and 5, respectively.

The cockerels given semisolid buttermilk made, with one exception, better gains than those not given buttermilk. All lots ate well except lots 5 and 6. These lots had a tendency to slow up on their eating toward the end of the experiment

on production, H. E. BOTSFORD (*N. Y. Agr. Col. (Cornell) Ext. Bul. 143*, *pp. 16, figs. 13*).—Directions for caponizing and related information.

influence of the vertical position of eggs on the development of ros in Gallus domesticus [trans. title], E. UMANSKI (*Zool. Anz., 68*, *No. 3–4, pp. 81–87, figs. 3*).—In each of two experiments 28 eggs were ted for 8 days in the vertical position, but in one experiment the small the egg was up and in the other the large end was up. After 8 days' tion with the small end up there were 11 living and 11 dead embryos, 6 had not developed. When the other end was up there were 15 living dead embryos, while 6 were undeveloped. Of the living embryos 5 in rmer and 4 in the latter experiment were abnormal. Of 28 eggs incu- as controls in the normal position there were 20 living and 3 dead os.

abnormalities observed in the eggs incubated in the vertical position associated with irregularities in the development of the amniotic and ois membranes. These abnormalities were explained in the eggs incu- vertically as due to the twisting and tension on the yolk membrane ıalaza resulting from the tendency of the germinal disc to remain on top.

the influence of sexual hormones upon the number of erythrocytes ercentage quantity of hemoglobine by fowl, L. J. BLACHER (*Biol. Gen., 6*), *No. 4–5, pp. 435–441*).—Studies of the number of red blood corpuscles ıe percentage of hemoglobin in the blood of 26 cocks and 33 hens of nt breeds showed that both the red cell count and the amount of hemo- were considerably higher in the males than in the females. This ted to 23.8 per cent in the number of red cells and 26.1 per cent in rcentage of hemoglobin. In man the respective differences between the xes were 9 and 12.5 per cent.

r castration the number of erythrocytes and percentage of hemoglobin ished significantly in males, but no significant differences were observed nales. When the sexual glands were transplanted into new hosts the r of erythrocytes was comparable with the number in the sex from which and was taken.

cat: Races, breeding, and diseases, E. LARIEUX and P. JUMAUD (*Le Races, Élevage, Maladies. Paris: Vigot Bros., 1926, pp. 272, figs. 29*).—rigin of the different types of domestic cats, standards for the different ies, and the anatomy and physiology of cats are taken up in turn, with a portion of the book devoted to diseases.

ory and practice of fox ranching, J. A. ALLEN and W. C. S. MCLURE (*lottetown, P. E. I.: Irwin Ptg. Co., 1926, pp. XV+248, pls. 23, fig. 1*).—A ır presentation of the principles of fox farming, dealing with the selec- ınd laying out of ranches, fox breeding, feeding, and management. A ierable portion of the book deals with fox parasites, diseases, and surgery.

DAIRY FARMING—DAIRYING

tory of the dairy industry, T. R. PIRTLE (*Chicago: Mojonnier Bros. Co., pp. XXII+645, figs. 223*).—The development of dairying in the different ries of the world is reviewed by first giving an idea of the natural ions, types and breeds of cattle and their development or importation, historical account of the cream, butter, cheese, condensed and evaporated and ice cream industries, with related information on cooperative enter- , consumption, educational institutions, cattle diseases, and the like. The ıt of each country ends with a list of important events in chronological

Proceedings of the Congress for the Feeding of Cattle and Dairy Control (*L'Alimentation du Bétail Bovin et le Contrôle Laitier. Travaux du Congrès. Paris, 1925. Paris:* [*Soc. Natl. Encour. Agr.*], *1926, pp.* [*4*]+*786, figs. 23*).—This includes the papers presented before the two sections of this congress, which met in Paris on October 28 and 29, 1925.

The following papers were given before the cattle feeding section: History of Publications on the Feeding of Cattle in France, by A. M. Leroy (pp. 1–27); New Theories of Feeding, by H. Simonnet (pp. 29–63); The Feeding of Breeding Cattle, by A. Lecomte (pp. 65–94); The Feeding of Dairy Cattle, by G. Jannin (pp. 95–126); Grated Potatoes in the Feeding of Livestock, by C. Bacon (pp. 127–131); The Production of White Veal Cattle, by Perrault (pp. 133, 134); The Feeding of Beef Animals of the Bovine Species, by E. Letard (pp. 135–145); The Feeding Value of Silage, by L. Brétignière (pp. 147–181); Feeding Standards for Livestock, by R. Gouin (pp. 183–192); New Studies of the Practical Value of Feeding Standards and Those Which Concern the Feeding of Dairy Cattle, by A. M. Leroy (pp. 193–208); The Principles of Unifying the Methods of Estimating the Feeding Value of Feeds, and Organized Method of Feed Control under Practical Agricultural Conditions, by J. E. Lucas (pp. 209–227). Ten papers were also given on the feeding of livestock, especially dairy cattle, in various regions of France.

The following papers were presented before the section on the control of dairies: The Development of Dairy Control in France: The Necessity of Cooperation Between the Associations for Control of Milk and Butter, by A. M. Leroy (pp. 325–381); Foreign Milk Control: General Considerations, by C. Porcher (pp. 383–400); Chemical Methods of Evaluating the Fat and Solids in Milk: Application of the Working of Societies of Milk Control, by C. Brioux (pp. 401–419); Modern Organization of a Milk Control Syndicate, by Prévot (pp. 421–456); Relations Between Dairy Control Groups and Herd Books, by Hédiard (pp. 459–469); The Organization of Meetings of Milk and Butter Producers, by J. Lefèvre (pp. 471–497), as well as 22 papers dealing with the control of dairy products in different sections.

The effect on milk production of feeding more than the Haecker, Eckles, and Savage requirements, H. T. Converse (*Jour. Dairy Sci., 9* (*1926*), *No. 4, pp. 388–406, figs. 3*).—The effect on milk production of supplying more digestible protein and more total digestible nutrients than necessary to maintain body weight was studied in 3 experiments conducted at the U. S. D. A. Experiment Farm at Beltsville, Md.

In the first and second experiments groups of 6 and 5 cows, respectively, were furnished with rations supplying the amounts of digestible protein and total digestible nutrients called for by the Savage standard to maintain body weight and milk production during the first and third 30-day periods. During the second period of the first trial the cows received 30 per cent more digestible protein and 15 per cent more digestible nutrients than were necessary to satisfy the requirements of this standard. The cows used were in advanced stages of lactation, having been milked from 6 to 18 months since freshening.

In the second period of the second trial the digestible protein and total digestible nutrients were 20 and 10 per cent, respectively, in excess of the requirement. In this experiment 10 days were allowed between periods for transition. The cows varied from 7 to 13 months in the period of lactation.

The results of these two experiments showed that milk production was 4.9 per cent in the first and 1.9 per cent in the second trial greater than the average for the first and third periods in the respective experiments. Calcu-

lated on the basis of the decline observed in the standard periods, when the cows declined approximately 20 per cent in rate of production, the surplus feed caused an increased production of about 16 per cent in the second experiment.

In a third experiment 6 cows, which had previously completed 365-day records on rations supplying 17 per cent more nutrients than the Savage standard, produced 2 per cent less milk in a succeeding lactation period on a ration calculated to satisfy the Savage standard. Correcting these data for the effect of age on milk production according to Graves and Fohrman (E. S. R., 54, p. 68), and for differences in the length of time that the animals were pregnant according to Ragsdale, Turner, and Brody (E. S. R., 52, p. 478), it was estimated that the 17 per cent increase in nutrients caused an increased milk production of 14 to 16 per cent.

Mineral supplements in rations for dairy cattle and green feed versus dry feed for dairy cattle, W. S. CUNNINGHAM and R. N. DAVIS (*Arizona Sta. Rpt. 1923, p. 473*).—Sixteen cows were divided into 4 groups with 2 Jerseys and 2 Holsteins in each group. Group 1 was fed sodium phosphate, group 2 bone ash, group 3 air-slaked lime, and group 4 no mineral supplement. One-half of the cows in each group were fed green feed whenever available.

No advantage in yield of milk and butterfat from feeding minerals was shown. As much difficulty was experienced in getting cows bred when feeding minerals as when no minerals were used. The experiment was discontinued after one year.

Fat-soluble vitamin.—XXVI, The antirachitic property of milk and its increase by direct irradiation and by irradiation of the animal, H. STEENBOCK, E. B. HART, C. A. HOPPERT, and A. BLACK (*Jour. Biol. Chem., 66 (1925), No. 2, pp. 441–449*).—In continuing this series (E. S. R., 54, p. 491) the antirachitic potency of different samples of milk was tested with reference to the previous irradiation of the animal or the milk itself by supplementing the diet of rats fed for 20 days on a rachitic ration with from 0.5 to 12 cc. of milk daily during a 10-day period. The rats were then killed and examined for rickets. The results showed that 12 cc. of milk, produced by stall-fed cows allowed some exposure to sunlight, were required to produce definite evidence of calcium deposition in the rats, but that 1 cc. of milk which had been exposed in a thin film to ultra-violet light for 30 minutes had a similar effect. A test of the effect of different lengths of exposure of the milk indicated that 30 minutes gives optimum results.

In further studies, with a milking goat, of the effect of irradiation of the animal, it was found that 12 cc. of normal milk were required to bring about incipient calcium deposition, but that after irradiation of the animal for 30 minutes daily only 2 cc. were required and after irradiation of the milk itself 0.5 cc. were sufficient to have the same effect. The irradiation of this goat appeared to stimulate her appetite and general physiological condition.

Experiments with another milking goat, irradiated 1 hour daily, showed that the potency of the milk was somewhat increased on the second day of irradiation as compared with the first. In this animal, which had just freshened, the antirachitic properties of the milk were not as high as for the goat used in the preceding experiment.

[Feeding experiments with dairy cattle at the Wisconsin Station] (*Wisconsin Sta. Bul. 388 (1926), pp. 111, 112, 114, 115, 127–131*).—The results of some experiments by E. B. Hart et al. are briefly noted.

Mineral supplements to poor roughage are important.—Three cows fed timothy hay, corn silage, and a grain mixture were poor producers of milk. In

addition, they were slow to breed and when bred tended to dry up from 6 weeks to 2 months earlier than 3 cows fed alfalfa hay.

Do cows need mineral supplements in sunlight?—Cows milking from 50 to 60 lbs. per day kept without direct exposure to sunlight on an otherwise adequate ration failed to maintain a calcium balance. With the same cows on the same ration but exposed to 6 hours' sunlight per day the loss of calcium from the body was reduced 25 per cent.

Rock phosphate not a substitute for bone meal.—Cattle and swine fed rock phosphate instead of bone meal as a mineral supplement became exceedingly stiff, rough in coat, and generally poor in condition. It is suggested that this injurious effect is due to fluorine associated with the rock phosphate.

Soy bean v. alfalfa hay for dairy cows.—Cows fed soy bean hay produced approximately the same amount of milk and butterfat as cows fed alfalfa hay. The cows on the soy bean ration gained only about one-half as much in body weight and wasted more of their hay. From the results of this experiment soy bean hay was calculated to be worth 73 per cent as much as alfalfa hay.

Rations for dairy calves.—At 6 months of age calves fed skim milk (not over 14 lbs. per head a day), clover hay, and a mixture of corn, oats, bran, and linseed meal gained 1.77 lbs. daily. Calves fed a minimum of whole milk (not over 400 lbs. from birth) and a grain mixture similar to the above gained 1.3 lbs. daily. The whole milk was discontinued when calves were from 7 to 9 weeks of age. Feeding semisolid buttermilk and dry skim milk increased the rate of gain over those receiving whole milk but also increased the cost of gain by a considerable margin.

Chopping alfalfa hay for dairy cows.—Preliminary work by I. W. Rupel and E. Arneson indicates that there was no advantage in chopping good alfalfa hay for dairy cows.

Chopping soy bean hay for dairy cows.—There was practically no difference in the production of cows fed chopped and unchopped soy bean hay. However, there was little waste in feeding the chopped hay. Chopping soy bean hay in this case increased its value 23 per cent.

[Experiments with dairy cattle at the Central Experimental Farm], G. B. ROTHWELL (*Canada Expt. Farms, Anim. Husb. Div. Rpt. 1925, pp. 7–23*).—The results of various feeding experiments with dairy cattle, dealing with the effect of pastures, comparisons of silage and roots, ground and whole roughage, corn distillers' grains, rye distillers' grains, and oat clippings, calf meals, and skim milk in the ration of dairy calves are briefly reported (E. S. R., 54, p. 472).

Care and management of the milk goat, E. C. VOORHIES (*Calif. Agr. Col. Ext. Circ. 6 (1926), pp. 24, figs. 8*).—A popular bulletin on milch goat production dealing with the breeding, management, feeding, and housing of milch goats, with descriptions of the different breeds and uses of goats' milk.

The secretion of butterfat, C. PORCHER (*Le Procès de la Matière Grasse du Lait. Lyon: Le Lait, 1925, pp. [2]+255, pl. 1, figs. 82*).—The physiology of fat secretion is described from the standpoint of the histological changes in the mammary gland and the origin of fat in milk. Most of the book deals with the variations in the fat content of milk as affected by the individual, different quarters of the udder, different times of milking, season, etc. One portion of the book deals with the detection of modifications of the fat content.

Testing dairy products, J. A. NEWLANDER (*Milwaukee, Wis.: Olsen Pub. Co., 1926, pp. 128, figs. 47*).—An outline for the testing of dairy products, consisting of directions for making tests for butterfat, specific gravity, acidity, and moisture.

A comparison of the Babcock, Gerber, and Roese-Gottlieb methods for determining the percentage of fat in milk and cream, A. C. DAHLBERG, G. E. HOLM, and H. C. TROY (*New York State Sta. Tech. Bul. 122 (1926), pp. 32*).—A total of 925 tests of milk and cream were made by the Roese-Gottlieb, Babcock, and Gerber methods in three different research laboratories and four dairy control laboratories. The results of the Roese-Gottlieb method varied in the different laboratories. The Babcock and the Gerber methods of determining the fat in milk and cream were found equally and sufficiently accurate for practical purposes.

[Experiments with dairy products at the Wisconsin Station] (*Wisconsin Sta. Bul. 388 (1926), pp. 94–98, fig. 1*).—The results of some recent experiments at the station are briefly noted, with special reference to the practical application. Some of these have been previously noted (E. S. R., 53, p. 474).

Bacteria in relation to heat sterility of milk.—Early work with this problem showed that the citrate fermentation in milk influenced its stability. Recent experiments by G. Helz et al. have shown that the ordinary acid-forming bacteria of milk do not attack the citric acid. It is, however, fermented by the colon bacteria and some other types. Citrates do not diminish until the acidity has reached a point which makes it unfit for ordinary use.

Pasteurization of curd in making American cheese.—Preliminary work by J. L. Sammis indicates that curd may be pasteurized by treating with hot water (140° F.) to improve the flavor and texture of cheese. The best results were obtained when pasteurization was done when curd acidity was high, about 0.6 per cent.

Stinker cheese investigations.—Recent investigations have led to the belief that stinker spots are caused by moist lumps of curd, due to imperfect cutting or accidentally left in the process of manufacture. The lumps are absorbed leaving a hole which, when the right combination of bacteria is present, results in a stinker spot.

Ice cream investigations.—Citrates and phosphates have been found by H. H. Sommer to have a pronounced effect in increasing the whipping ability of ice cream mixes. When 0.4 per cent sodium citrate was added to a mix and aged for 24 hours, a 100 per cent overrun was obtained in 4 minutes. The same mix without the sodium citrate required from 10 to 15 minutes for the same overrun. On the other hand, when 0.1 per cent calcium lactate was added an overrun of 90 per cent was produced in 18 minutes, and the same mix without the calcium lactate produced 95 per cent overrun in 12 minutes.

Sommer and his associates suggest methods that will simplify the testing for fat and total solid content of ice cream. The first of these tests is based upon the fact that glacial acetic acid will prevent the charring of sugars by concentrated sulfuric acid. The second test is a method for removing moisture in a steam heated vacuum oven.

Process cheese and Joint Resolution No. 54, S., Legislature of 1925, J. Q. EMERY and H. KLUETER ([*Wis. Dairy and Food Comn.*] *Bul. 15 (1926), pp. 45*).—The results of the study of the manufacture in several plants of so-called processed cheese are presented by Emery, and a discussion of the necessary legislation relating to this project is given by Emery and Klueter.

VETERINARY MEDICINE

[Work in animal pathology in Wisconsin] (*Wisconsin Sta. Bul. 388 (1926), pp. 102–108, figs. 2*).—In connection with cooperative control work with contagious abortion in cattle, F. B. Hadley and Lothe have found that animals, several of which agglutinated only in a dilution of 1 to 50, on retests eventu-

The control work, in a herd in which the animals reacting to the blood test were removed, resulted in a gradual elimination of the disease. The best results have been found to follow the use of an agglutination test fluid prepared by pooling several strains of *Bacterium abortus* of bovine origin. It is pointed out that retests may well be made between 60 and 90 days, and continued until no new reactors to the test appear. Reactors that gradually become nonreactors should never be returned to the clean herd. The importance of stable hygiene and sanitation is emphasized, and a brief reference is made to the value of vaccination. In abortion work by B. L. Warwick, E. M. Gildow, and Hadley, rabbits were found to offer advantages, a virulent strain of *B. abortus* producing abortion in them in most cases when inoculated from the fourteenth to twentieth day of pregnancy. In studies of an outbreak of abortion in a flock of some 300 breeding ewes, Warwick found *Vibrio foetus* to be the cause.

Reference is made to the inheritance of hernia in swine, a report of which by Warwick has been noted (E. S. R., 56, p. 129). The importance of diseases in fox farming, and particularly a fatal affection of fetal and newborn fox pups due to a very short rod belonging to the Salmonella group is referred to as studied by Hadley.

In work with bacillary white diarrhea, B. A. Beach, Gildow, and D. M. Warren found that the older hens are not an important source of *B. pullorum* infection for chicks. They conclude that *B. pullorum* is quite commonly present in the content of the intestinal tract of hens that appear normal. They have found coccidiosis to be spreading rapidly, and to be the most destructive disease in commercial flocks in the State at the present time. Beach and Warren have found kamala to be a satisfactory remedy for the tapeworm in poultry (E. S. R., 55, p. 399).

Report of the veterinary director general for the year ending March 31, 1926, G. Hilton et al. (*Canada Dept. Agr., Rpt. Vet. Dir. Gen., 1925–26, pp. 41*).—In the first part of this report, G. Hilton (pp. 3–13) deals with some of the more important diseases to be guarded against, outbreaks of which occurred during the year. The work of the pathological division is reported upon by E. A. Watson and his associates (pp. 14–23), particular attention having been given to tuberculosis research work. The report of the meat and canned foods division, by R. Barnes (pp. 24–29) follows.

Handbook of the Diseases of Animals Acts and orders of the Minister of Agriculture and Fisheries thereunder (*London: Min. Agr. and Fisheries, 1926, pp. XIV+1–92, 121–185, 211–466, 491–706, 731–749*).—Following the introduction, the several parts of this handbook deal with the Diseases of Animals Act (pp. 1–92); Miscellaneous Acts (pp. 121–185); Disease Orders (pp. 211–466); Exportation, Importation, and Transit Orders (pp. 491–706); and Miscellaneous Orders (pp. 731–749).

Annual administration reports of the Bombay Veterinary College, Bombay City and Harbour Veterinary Department, and Civil Veterinary Department in the Bombay Presidency (including Sind) for the year 1925–26, K. Hewlett, E. S. Farbrother, J. D. Buxy, P. R. Cadell, and A. S. V. Scott (*Bombay Vet. Col., City and Harbor Vet. Dept., and Civ. Vet. Dept. Ann. Admin. Rpts. 1925–26, pp. 60*).—These are the annual reports and include data on the occurrence of infectious diseases of livestock, results of preventive inoculation, etc. (E. S. R., 54, p. 379).

Textbook of comparative physiology, C. G. Rogers (*New York and London: McGraw-Hill Book Co., 1927, pp. XVI+635, [pl. 1], figs. [148]*).—This volume is said to be the outgrowth of a course in comparative physiology offered for a

number of years to students in Oberlin College. A bibliography of 30 pages is included.

The operative technique of animal experiments, H. F. O. Haberland (*Die Operative Technik des Tierexperimentes. Berlin: Julius Springer, 1926, pp. X+336, figs. 300*).—A detailed, illustrated account of the methods employed in operative procedure.

The relation of animal diseases to public health, T. G. Hull (*Ill. State Acad. Sci. Trans., 17 (1924), pp. 274–278*).—This discussion is a contribution from the Illinois Department of Public Health.

Local immunization: Specific dressings, A. Besredka, edited and trans. by H. Plotz (*Baltimore: Williams & Wilkins Co., 1927, pp. XI+181*).—In the discussion of this subject there are several chapters dealing, respectively, with anthrax (pp. 1–45), staphylococcus and streptococcus infections (pp. 46–84), dysentery (pp. 85–107), the typhoid fevers (pp. 108–143), and theory (pp. 144–178).

Pharmacopoea germanica (*Deutsches Arzneibuch. Berlin: G. Schenck, 1926, 6. ed., pp. LV+854; rev. in Jour. Amer. Med. Assoc., 88 (1927), No. 9, pp. 648, 649*).—The sixth edition of the German Pharmacopoeia.

A method for repeatedly sampling the blood of the portal vein in healthy animals, M. A. Blankenhorn (*Jour. Expt. Med., 45 (1927), No. 2, pp. 191–194, fig. 1*).—The author describes a method used at the Rockefeller Institute for Medical Research for repeated sampling of the blood of the portal vein in healthy animals, it having been employed in 13 dogs with success in 8.

Microbic dissociation: The instability of bacterial species with special reference to active dissociation and transmissible autolysis, P. Hadley (*Jour. Infect. Diseases, 40 (1927), No. 1, pp. 312, pls. 6*).—This is a contribution from the hygienic laboratory of the University of Michigan.

The filtrable viruses [trans. title], F. Lucksch (*Prager Arch. Tiermed., 5 (1925), A, No. 3–4, pp. 83–140, figs. 12*).—Following a general discussion the author deals with the acute infectious diseases due to filtrable viruses, 12 in number; those localized in particular organs or tissues, 2 in number; those causing changes in the central nervous system, 5 in number; and those localized in the haematopoietic system, 2 in number, etc.

Animal parasites of man, the diseases which they transmit, and their treatment.—I, Natural history of animal parasites of man, M. Braun (*Die Tierischen Parasiten des Menschen, die von ihnen Hervorgerufenen Erkrankungen und ihre Heilung.—I, Naturgeschichte der Tierischen Parasiten des Menschen. Leipzig: Curt Kabitzsch, 1925, 6. rev. and enl. ed., pp. X+608, figs. 416*).—The first volume in this work (E. S. R., 36, p. 354) deals with Parasites and Parasitism (pp. 1–8); Protozoa (pp. 9–157); Platyhelminthes (pp. 157–311); Nematoda (pp. 311–404); Acanthocephala (pp. 404–406); Gordiidae (p. 407); Hirudinea (pp. 407–410); and Arthropoda (pp. 410–488). The volume includes a classified bibliography (pp. 489–593).

Animal parasites of man, the diseases which they transmit, and their treatment.—II, Clinic and therapy of animal parasites of man, O. Seifert (*Die Tierischen Parasiten des Menschen, die von ihnen Hervorgerufenen Erkrankungen und ihre Heilung.—II, Klinik und Therapie der Tierischen Parasiten des Menschen. Leipzig: Curt Kabitzsch, 1926, 3. ed., pp. VI+574, figs. 21*).—This is the third edition of the second volume of the work noted above. It deals with Amoebina (pp. 1–51); Flagellata (pp. 51–61); Trypanosomidae (pp. 61–95); Haemospordia (pp. 95–159); Infusoria (pp. 159–167); Platyhelminthes (pp. 167–188); Cestodes (pp. 188–268); Echinococcus (pp. 268–334); Nematoda (pp. 334–412); Hirudinei (pp. 412–419); Arthropoda (pp. 419–447); Insecta (pp. 447–501); and Myiasis (pp. 501–538).

Sensitising powers of proteins of parasites as tested by the isolated sensitized uterus reaction, A. W. Turner (*Roy. Soc. Victoria, Proc., n. ser., 38 (1926), pp. 24–54, figs. 2*).—In the course of investigations at the Veterinary Research Institute of the University of Melbourne the sensitizing powers of the following parasites were determined: *Ascaris equi*, *A. suilla*, *Toxascaris limbata*, *Onchocerca gibsoni*, *Fasciola hepatica*, *Gastrophilus haemorrhoidalis*, *G. nasalis*, and *G. intestinalis*. In addition, it was found necessary to determine the action on the uterus of a few substances which were needed as preservatives, including toluol, chloroform, phenol, and glycerine. The details in the investigation are presented, the conclusions reached being as follows:

"Protein-containing extracts of parasites can sensitize the uterus of guinea pigs when injected subcutaneously. Such sensitization is strictly specific, though a peculiar simultaneous nonspecific sensitiveness may exist toward extracts of other related forms. Desensitization of the uterus towards the nonspecific extract still leaves the muscle sensitive to the extract used for sensitizing the guinea pig. Desensitization towards the specific extract abolishes sensitiveness toward the nonspecific extract. The above phenomenon is analogous with that of agglutinin or precipitin action. The sensitized uterus reaction suggests itself as a means whereby mutilated parasites might be identified, or whereby the supposed identity of any two parasitic forms might be tested." A list of 33 references to the literature is included.

Dogs and cats concerned in the causation of creeping eruption, E. F. White and W. E. Dove (*U. S. Dept. Agr., Off. Rec., 5 (1926), No. 43, p. 6*).—The authors report upon investigations conducted by the Bureau of Entomology.

This human skin disease occurs chiefly in the South Atlantic and Gulf States, but has been reported as far north as New Jersey and it is said that cases have also been encountered in the interior as far north as Oklahoma. Working in 1925 in cooperation with J. L. Kirby-Smith at Jacksonville, Fla., the authors demonstrated the cause of the eruption to be a nematode larva. In a further study of the disease the authors have recovered in cultures infective nematode larvae from the feces of the dog and the cat examined from a locality where and when there was a high incidence of creeping eruption. They have applied these larvae to their own skin and produced thereby symptoms and lesions characteristic of and now known clinically as those of creeping eruption. They have thus far found two species of these nematode larvae, recognized morphologically as *Ancylostoma braziliense* De Faria and *A. caninum*, in 26 out of 27 dogs taken from the streets of Jacksonville and in both of two cats. *A. braziliense* was encountered in much larger numbers than *A. caninum*.

A biochemical method of differentiating Brucella abortus from Brucella melitensis-paramelitensis, I, F. Huddleson and E. Abell (*Jour. Bact., 13 (1927), No. 1, p. 13*).—This is a contribution from the Michigan Experiment Station.

The authors have found that *B. abortus* in its growth activity on a suitable medium under aerobic incubation causes the liberation of hydrogen sulfide gas, while *B. melitensis* or *B. paramelitensis* does not. The gas may be detected by means of lead acetate paper.

In the course of the authors' study 92 strains of *B. abortus*, 30 strains of *B. melitensis*, and 10 strains of *B. paramelitensis* were employed. All of the strains were isolated either in Europe or in this country from bovine, porcine, human, caprine, and equine sources.

The hydrogen sulfide test so far has agreed with the agglutinin absorption test in placing the strains in the abortus or melitensis group. The hydrogen sulfide test is considered to offer a rapid procedure for the grouping of newly

Investigations with acid-fast bacteria (*Wisconsin Sta. Bul. 388 (1926), pp. 90, 91*).—Studies by E. G. Hastings and B. A. Beach are briefly noted, with results previously referred to (E. S. R., 55, p. 497).

The histological expression of the natural resistance of rabbits to infection with human and bovine type tubercle bacilli, P. A. LEWIS and E. S. SANDERSON (*Jour. Expt. Med., 45 (1927), No. 2, pp. 291–304*).—The authors consider the natural resistance of rabbits to infection with the tubercle bacillus of human type to be apparently referable to a failure of this type of bacillus to multiply in the body of this species to any considerable extent.

Anaphylaxis and the tuberculin reaction, M. DORSET (*Jour. Amer. Vet. Med. Assoc., 69 (1926), No. 6, pp. 711–716*).—An address presented at the Eastern States Tuberculosis Conference, held at Burlington, Vt., in June, 1926.

A few observations on the use of vaccines in the treatment of mastitis in cattle, G. A. MOORE (*Vet. Rec., 7 (1927), No. 7, p. 155*).—A brief discussion with notes on three cases in which treatment with vaccines was tried with apparently beneficial results.

Vibrios from calves and their serological relation to vibrio fetus, T. SMITH and M. L. ORCUTT (*Jour. Expt. Med., 45 (1927), No. 2, pp. 391–397*).—The authors find the calf vibrios thus far studied to include one strain serologically distinct from the fetal strains, while the others are closely related to the fetal strains though not identical with them. The pathogenic characters of the calf vibrios, either as possible descendants of *Vibrio fetus* or as independent factors in the production of enteritis, have not been demonstrated.

Cutaneous tuberculosis (?) in buffaloes [trans. title], J. KOK and M. ROESLI (*Nederland. Indische Bl. Diergeneesk., 38 (1926), No. 6, pp. 465–472, pl. 1; Eng. abs., p. 472*).—The authors record the finding of nodules, at different places on the bodies of three animals, which ranged from the size of a hazelnut to that of the average potato. Groups of acid-fast microorganisms resembling those of tuberculosis were detected. Three stages, (1) small tumors of firm consistence, (2) larger ones showing radial cheesy degeneration, and (3) the largest ones as abscesses containing whitish matter mixed with calcified particles, were distinguished.

A spirillum as the cause of infectious abortion in a flock of sheep [trans. title], W. GRIMM (*Tierärztl. Rundschau, 33 (1927), No. 3, pp. 39–43*).—The author reports upon the occurrence of abortion in a flock of sheep in Silesia, in which *Spirillum abortus ovis* was found to be the cause. Of 212 pregnant dams in the flock, 27 aborted. Pregnant guinea pigs which were subcutaneously injected with the spirillum-containing material aborted. The control of this infection was brought about by hygienic measures and the injection of all the animals with a 15 per cent solution of atoxyl.

Immunizing young pigs against cholera, III, J. W. BENNER (*N. Y. State Vet. Col. Rpt. 1924–25, pp. 225–230*).—This contribution is in continuation of previous experiments (E. S. R., 55, p. 371).

Of 12 animals that received the hyperimmunizing dose of virus of 5 cc. per pound live weight intravenously, 5 died. Of 34 that received the trial injection of 2 cc. of virus intramuscularly, 4 died, and 1 of these had rickets badly when given the trial injection. Results in this experiment indicate a grade of immunity sufficiently high to withstand 2 cc. of virus intramuscularly, which is easily sufficient to protect from natural exposure but not sufficiently high to protect from the enormous doses of virus used in the special process of hyperimmunization.

Autogenous vaccines in the treatment of chronic nasal catarrh in horses, O. DAVENPORT (*Vet. Jour., 83 (1927), No. 620, pp. 78–83*).—In this discussion of autogenous vaccines the author deals with the supply of material, preparation

of the vaccine, organisms present, sterilization of the vaccine, standardization of bacterial suspensions, adjustment of dosage, administration of the vaccine, and results. The study of the organisms present indicates that those causing chronic nasal catarrh in horses are, mainly, staphylococci and streptococci.

***Four years' progress in the control and eradication of bacillary white* diarrhea in Maine,** E. R. Hitchner and F. L. Russell (*Poultry Sci., 5 (1926), No. 3, pp. 117–120, figs. 2*).—This is a summary of results obtained during the 4 years of testing in Maine.

The metazoan parasites of poultry in Australia, I. C. Ross (*Jour. Aust. Vet. Assoc., 2 (1926), No. 4, pp. 129–139, figs. 3*).—A brief summary of information on the subject.

AGRICULTURAL ENGINEERING

[*Agricultural engineering studies at the Wisconsin Station*] (*Wisconsin Sta. Bul. 388 (1926), pp. 11–17, figs. 3*).—In continuation of studies on silo filling (E. S. R., 55, p. 882), it has been found by F. W. Duffee that flywheel silage cutters of 11 in. or smaller are not economical to operate. In order to get good capacities on such small machines it is usually necessary to operate them at more than the most economical speed, which increases the difficulty of feeding. It seems better to operate a medium sized machine at a slower speed. It has been found that flywheel machines larger than 16 in. or cylinder machines larger than 18 or 20 in. are too large to be practical for ordinary use. Reducing the speed of the cylinder or flywheel also reduces the speed of the blower fan.

In corn cultivating tests by Duffee and J. B. Woods, the 2-row motor cultivator was apparently very practical in fairly small fields and on quite hilly land. The 4-row machine apparently would not be satisfactory under such conditions. Equally good, if not better, work was done with both the 2-row and 4-row cultivators than is commonly done with horses.

The tests of harvesting and threshing with the combine indicated that wheat, rye, barley, and oats can be threshed as soon as cut and the grain safely stored if provision is made for blowing air through the grain. Seven hours of blowing during as many days quite satisfactorily dried the grain and prevented it from heating.

In hay drying tests by Duffee and K. C. MacLeish it was found that 200 lbs. of coal was required to dry out 1 ton of hay. The results so far obtained are said not to warrant definite recommendations, and the proposition seems rather questionable except possibly under very special conditions.

Drainage of forest lands was followed by an increase in the rate of diameter growth dating back to the time of drainage.

Surface water supply of New Mexico, 1888–1925, G. M. Neel (*Santa Fe: State Engineer, [1926], pp. 373*).—The results of measurements of flow made on the principal streams of New Mexico are presented.

Irrigation and drainage problems in the Gallatin Valley, H. E. Murdock (*Montana Sta. Bul. 195 (1926), pp. 36, figs. 24*).—Some of the pressing problems in irrigation and drainage in the Gallatin Valley, Mont., are described, and suggestions are offered for their solution.

In general the soils of the valley are of a fine texture, consisting of heavy alluvial or silty loams which frequently carry extensive accumulations of cobblestones and gravel. There seems to be a plentiful supply of water for irrigating all of the land in the valley, but the difficulty is to get this water to the right place at the right time. The problems of irrigation and drainage are rather intimately associated, as the seepage conditions throughout the

valley are largely brought on by the irrigation. During low water in some seasons the seepage and evaporation losses are excessive in the river channels. At present it is necessary to endure these losses in order to get a supply of irrigation water to the older water-right ditches which are in the lower part of the valley. If these needs could be supplied by pumping water from the underground supply, the problems of both irrigation and drainage would be at least partly solved. The belief is expressed that this is a practical and economical method of relief. It is also believed that the equitable and successful solution of the problems would require the organization of the valley into one large irrigation and drainage district.

[Irrigation studies at the Arizona Station], G. E. P. SMITH, W. E. CODE, and H. C. SCHWALEN (*Arizona Sta. Rpt. 1923, pp. 488–492*).—The progress results of ground water studies, artesian well tests, stream flow measurements, and related subjects are briefly reported.

Irrigation by overhead sprinkling, H. A. WADSWORTH (*Calif. Agr. Col. Ext. Circ. 4 (1926), pp. 37, figs. 12*).—Working data on the planning and installation of overhead sprinkling irrigation systems for California agriculture are presented, based on studies conducted by the California Experiment Station.

It has been found that irrigation by overhead sprinkling is costly and is limited to the production of high-priced crops on land of high value. Intensive soil moisture sampling during the irrigation season of 1925 indicated that adequate soil moisture penetration can be secured by the sprinkling of decomposed granite and sandy loam soils if the sprinkling equipment is properly selected and intelligently operated. The evidence with heavy soils is not so conclusive.

Irrigation with treated sewage in western Texas, H. N. ROBERTS and D. L. JONES (*Engin. News-Rec., 97 (1926), No. 26, pp. 1026–1028, figs. 3*).—A description is given of a sewage farm of 100 acres which is operated under the direction of the Texas Experiment Station and which has been receiving the effluent from the sewage works of Lubbock, Tex., since February, 1926. Eight different crops have been irrigated, and the flow averages about 1.05 acre-ft. per day. It is stated that not the slightest odor or other bad feature is noticeable except the light green color of the clear sewage in the canals. The soil is a fine, loose, sandy loam underlain by a sandy clay. These formations seem able to assimilate very large quantities of water and are able to retain a small rainfall for a long time. February irrigation has been found to be very important, and it is said to be possible to detect to a row where February irrigation was used.

Water supply and sewage disposal systems, I. D. WOOD (*Nebr. Agr. Col. Ext. Circ. 723 (1926), pp. 24, figs. 10*).—Practical information on the planning and construction of water supply and sewage disposal systems for farms in Nebraska is presented, together with working drawings and bills of material.

The farm water supply.—Part II, The use of the hydraulic ram, F. G. BEHRENDS (*N. Y. Agr. Col. (Cornell) Ext. Bul. 145 (1926), pp. 28, figs. 16*).—Practical information on the installation, operation, and use of the hydraulic ram in farm water supply systems is presented, together with numerous diagrammatic illustrations.

Stone removal as a phase of land clearing, A. J. SCHWANTES (*Agr. Engin., 7 (1926), No. 12, pp. 403–405, figs. 6*).—This paper, which is a contribution from the Minnesota Experiment Station, was presented at the twentieth annual meeting of the American Society of Agricultural Engineers at Lake Tahoe, Calif., in June, 1926. It is pointed out that practically all of the field stone in Minnesota is of granitic type. The handling of field stone is discussed, first, as to the removal of large bowlders by explosives or special mechanical devices,

and, second, the removal of those stones which are small enough to be handled readily by one or two men.

Terracing farm lands in Texas (*Tex. Agr. Col. Ext. Bul. B-61* [*rev.*] (*1926*), *pp. 16, figs. 11*).—Practical information on the terracing of farm lands in Texas is presented, including descriptions of machines used for the purpose (E. S. R., 42, p. 888).

A. S. T. M. Standards, 1926 (*Philadelphia: Amer. Soc. Testing Materials, 1926, pp. 102, figs. 15*).—This pamphlet comprises the second supplement to the 1924 book of standards of the American Society for Testing Materials and contains 16 standards for materials used in structures and for metals used in machinery.

An elementary treatise on statically indeterminate stresses, J. I. Parcel and G. A. Maney (*New York: John Wiley & Sons; London: Chapman & Hall, 1926, pp. XIII+368, pls. 3, figs. 178*).—This book contains chapters on deflections; general theory of statically indeterminate stresses; special methods of attack; continuous girders; the rigid frame; the elastic arch; secondary stresses; and general discussion of statically indeterminate construction, historical review, bibliography.

Recommended building code requirements for working stresses in building materials, I. H. Woolson et al. (*U. S. Dept. Com., Bur. Standards, Elimination of Waste Ser., BH9* (*1926*), *pp. VI+53, figs. 4*).—This report is the sixth of a series on the elimination of waste and is in three parts. Part 1 describes the organization and purposes of the Building Code Committee, part 2 presents requirements recommended for adoption in building codes, and part 3 explains briefly the basis of the recommendations of part 2 and discusses the conditions by which they are limited. Various references to good building practice are also given, together with other information helpful to building code committees Some of this material, especially stress tables and formulas for timber, seems quite suitable for use by agricultural engineers.

Concrete designers' manual, G. A. Hool and C. S. Whitney (*New York and London: McGraw-Hill Book Co., 1926, 2. ed., pp. XII+329, figs. 222*).—This is the second edition of this book (E. S. R., 46, p. 85). It contains tables and diagrams for the design of reinforced concrete structures, and sections on slabs, flat slabs, rectangular beams, doubly reinforced beams, T-beams, shear reinforcement, columns, bending and direct stress, footings, symmetrical arches, miscellaneous topics and rulings pertaining to design and working stresses.

***Elements of heat-power engineering.*—Part I, Thermodynamics and prime movers**, W. N. Barnard, F. O. Ellenwood, and C. F. Hirshfeld (*New York: John Wiley & Sons; London: Chapman & Hall, 1926, 3. ed., pp. XII+493, pls. 3, figs. 257*).—This is the third edition of part I of this book. It contains chapters on fundamentals regarding energy and its transformation; historical outline; illustrations of modern power plants, energy equations; equilibrium, reversibility, and availability; entropy; the properties of gases; thermodynamic processes of gases; the indicator diagram; compressed air; gas cycles; efficiencies and performances of engines; internal-combustion engines—types and mechanical features; internal-combustion engines—actual operation, power, and performance; properties of vapors; thermodynamic processes of vapors; the simple cycles of vapor engines and vapors; the reheating, regenerative, and binary cycles; the reciprocating steam engine; and steam turbines—general.

Detonation characteristics of petroleum motor-fuels, S. P. Marley, D. R. Stevens, and W. A. Gruse (*Jour. Soc. Automotive Engin., 20* (*1927*), *No. 2, pp. 214–220, figs. 3*).—Studies conducted at the Mellon Institute of Industrial Research are reported.

The results showed that no dependable method is available for determining the detonating tendency of motor fuels except that of direct engine tests. A ratio was found for the knock-reducing tendency of a naphthene, an olefin, and an aromatic hydrocarbon differing from that indicated by the work of Ricardo. Evidence is presented for the general belief that the detonating tendency of gasoline fractions increases with a rise in the boiling point.

The conclusion is drawn that while it is probable that cracking offers the readiest way for most petroleum refiners to produce motor fuels of improved antiknock value from petroleum, it does not necessarily follow that all cracked gasolines constitute satisfactory antiknock motor fuels. The results obtained by the use of different standard fuels indicate the desirablity of an agreement as to detonation standards.

An examination for detonating qualities of 18 petroleum gasolines, using a single cylinder engine, showed an aromatic equivalence of paraffins, naphthenes, and unsaturated and aromatic hydrocarbons of 5:4:1.

Experiments were made in which a constant proportion of one hydrocarbon of each class was added to a gasoline and the detonating tendency of the resulting mixture determined by engine tests. The use of two gasolines as base fuels and a system of intercomparisons gave results indicating an equivalence shown by the ratio 2:2:1. It was found that the degree of correlation between results by engine tests and results by chemical analysis will vary with the quality of the standard fuel employed.

Detonation specifications for automotive fuels, G. EDGAR (*Jour. Soc. Automotive Engin., 20 (1927), No. 2, pp. 245, 246*).—It is pointed out that to draw detonation specifications for fuels a reproducible primary standard fuel must be developed and methods of comparing fuels must be agreed upon. The composition of gasoline is so complex and the knocking characteristics of its different constituents are so varied that great difficulty has been encountered in finding one or more hydrocarbons the purity of which could be definitely established by test and which would thus be absolutely reproducible. Two hydrocarbons are cited that seem to be ideally suited for standard reference fuels, namely, pure normal heptane, C_7H_{16}, and pure octane, C_8H_{18}, which is prepared synthetically from tertiary butyl alcohol. By mixing these two hydrocarbons in different proportions it has been found possible to duplicate the knocking characteristics of any commercial fuel between the limits of 60 per cent of heptane and 40 per cent of octane and 40 per cent of heptane and 60 per cent of octane.

Studies in rural electrification (*Wisconsin Sta. Bul. 388 (1926), pp. 6–11, figs. 4*).—The progress results of a series of studies by F. W. Duffee and W. C. Krueger on the application of electricity to different farm practices in Wisconsin are briefly presented.

A study of rates for rural service has indicated that a just rate should consist of a monthly service charge to cover approximately the fixed charges and a low rate for the current.

In studies of practical equipment, it has been found practical and economical to use electric cooking where cheap fuel is not available on the farm and electric refrigeration for the household and the dairy. House heating, other than auxiliary small heaters, field work with electric motors, ultra-violet ray treatment for ordinary farm conditions, and heating water for the household have not been found practical or economical.

Effective haying equipment and practices for northern Great Plains and intermountain regions, L. A. REYNOLDSON and C. D. KINSMAN (*U. S. Dept. Agr., Farmers' Bul. 1525 (1927), pp. II+28, figs. 23*).—A description is given of improved equipment used for handling hay by ranches in different sections, of

effective practices that are employed, and of the organization and handling of haying crews on different ranches.

Dust respirators: Their construction and filtering efficiency, S. H. Katz, G. W. Smith, and E. G. Meiter (*U. S. Dept. Com., Bur. Mines, Tech. Paper 394 (1926), pp. IV+52, pl. 1, figs. 28*).—This paper describes representative types of dust respirators, and presents the results of laboratory tests to determine their filtering efficiencies and resistances to air flow.

The efficiencies of the industrial dust respirators in restraining tobacco smoke ranged from 5 to 33 per cent when the air is passed at the rate of 32 liters per minute. A gas mask canister with two filters of absorbent cotton showed 63 per cent efficiency. A flat felt filter was most efficient, showing 97 per cent. The efficiencies against silica dust floated in air ranged from about 9 to 70 per cent for the dust respirators. Most of the silica particles were 1 μ in diameter.

Filters of various fabrics, including cheesecloth, canton flannel, unbleached muslin, closely woven bleached muslin, filter paper, and absorbent cotton, all so made as to expose exactly 100 sq. cm. of filter area, were tested against tobacco smoke and silica dust in air flowing at the rate of 10 liters per minute. Each material was tested in a single layer and in multiple layers. The results showed that each layer of fabric removes about the same proportion of smoke or dust that penetrates to it before the filters become clogged or altered by deposits of an arrested material. Consequently, when the efficiency of a single ply of a filter is known, the efficiency of any multiple ply filter of that material may be calculated.

It was found that silica dust clogged filters rapidly and increased the resistance to air flow, but some materials were more resistant to clogging than others. The dense filters of paper or closely woven muslin clogged most rapidly. Filters of loose texture, like cheesecloth or absorbent cotton, clogged the least. The efficiencies of the filters were increased by clogging with dust until eventually many filters gave an efficiency of 100 per cent. Woolen fabrics proved to be no better filters than cotton fabrics of similar texture.

The efficiency of the filters decreased somewhat with an increase in the rate of air flow. The resistance of the filters to air flow increased in proportion to the number of plies of fabrics after the first ply. The first filter layer showed a somewhat higher resistance than the additional ones. It was found that air filters of high efficiency can be made with a sufficient number of plies of material that has a low efficiency per single ply. Such filters have less resistance to air flow than equally efficient filters made of fewer plies of the higher efficiency materials. The thicker filters of loose textured material clogged less rapidly than equally efficient filters composed of fewer plies of tightly woven materials.

A new type of dust respirator was designed and constructed according to the principles brought out in the tests, and consists of a large filter of canton flannel. At an air flow of 85 liters per minute the efficiency of this respirator was 93 per cent against silica dust.

Plans for concrete houses (*Chicago: Portland Cement Assoc., 1925, 3. ed., pp. 79, figs. 117*).—Plans and general specifications for a large number of concrete houses are presented.

Sunlight movable hog houses for Kentucky, E. J. Wilford and J. B. Kelley (*Ky. Agr. Col. Ext. Circ. 198 (1926), pp. 22, figs. 14*).—Practical information on the planning and construction of sunlight movable hog houses for Kentucky conditions is presented, together with working drawings, bills of material, and a list of hog-house plans and equipment.

House the hen efficiently and economically, J. G. HALPIN, J. B. HAYES, and N. S. FISH (*Wis. Agr. Col. Ext. Circ. 184 (1925), pp. 19, figs. 18*).—Practical information on the planning of poultry houses for Wisconsin conditions is given, together with working drawings and bills of material.

The Dutch oven or cement brooder stove, H. B. CARROLL, JR., and E. B. HILLIER (*Pullman: Wash. State Col. Ext. Serv., 1926, pp. [6], figs. 6*).—The Dutch oven or cement brooder stove is described and illustrated.

Principles of refrigeration, W. H. MOTZ (*Chicago: Nickerson & Collins Co., 1926, pp. XI+657, pls. 10, figs. 153*).—This is a comprehensive treatise on the fundamental principles of the operation of ice making and refrigerating machinery, on the properties and values of the principal media used in modern refrigerating apparatus, on the transmission of heat, on the functions and values of insulating materials, on the construction and operation of the various parts of refrigerating apparatus, and on the application of refrigeration to its varied uses.

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in agricultural economics at the Wisconsin Station, 1924–1926] (*Wisconsin Sta. Bul. 388 (1926), pp. 17–26, 126, figs. 2*).—Results of work in agricultural economics not previously noted (E. S. R., 55, pp. 81, 84, 485) are given.

Farm cost investigations.—Farm incomes averaged $1,074 in 1924 as compared with $1,205 in 1923, as shown by a study conducted by P. E. McNall. The results of a study of the cost of horse work on 60 Walworth County farms were as follows:

Horse work costs, 60 Walworth County farms, 1922–1924

Year	Cost of horse labor per hour		Crop acres per horse		Average per horse for year	
	Average	Range	Average	Range	Hours worked	Cost
	Cts.	Cts.				
1922	15.0	7.8–23.6	17.7	8–30	707	$106
1923	14.6	9.5–40.0	16.4	8–27	635	93
1924	14.4	8.7–29.1	16.5	7–39	675	97

Feed represented approximately two-thirds of the cost of keeping horses. The highest per hour cost of horse work was on farms having tractors, showing that horse work costs are not reduced in proportion to the increased cost due to use of tractors. The increasing of the number of hours of work per horse from 419 to 1,071 decreased the cost per hour from 19.8 to 10.9 cts.

A study of farm taxes.—In this study conducted by B. H. Hibbard and B. Allin analysis was made of 13,000 city, 1,854 village, and 4,214 farm State income tax reports filed in Dane County. In 1924, farmers spent 19 per cent of their net income for taxes, the city group 6.5 per cent, and the village group 5.9 per cent. Of the above number 214 of the farm group, 1,353 of the city group, and 133 of the village group made reports in the years 1913, 1914, 1918, 1919, 1923, and 1924. These reports showed the following changes in net income and percentage of such income paid for taxes.

Average net income and percentage spent for taxes, 1913 and 1914, 1918 and 1919, and 1923 and 1924

	1913 and 1914		1918 and 1919		1923 and 1924	
	Net income	Percentage taxes	Net income	Percentage taxes	Net income	Percentage taxes
Farm	$1,089	13.1	$3,156	7.9	$1,436	20.8
City	2,037	4.8	3,103	7.5	4,161	9.2
Village	1,462	4.9	2,451	4.7	2,266	8.1

Similar comparisons based on 1,818 in the farm group, 3,224 in the city group, and 362 in the village group for 1918–1919 and 1923–1924 showed the increase in the percentages spent for taxes to be from 6.2 to 18.9 in the farm group, from 5.6 to 7.8 in the city group, and from 3.8 to 6.6 in the village group.

Studies in farm living costs.—Records of nine families on dairy and poultry farms show that from 15.4 to 40.1 per cent of the total income is spent for food. This study is being directed by A. L. Marlatt and W. Hale.

The principle of comparative advantage applied to farm management studies of regional competition between farmers, J. W. Tapp (*Jour. Farm Econ., 8 (1926), No. 4, pp. 417–426*).—A discussion of the merits of the principle of comparative advantage as used by writers on international trade compared with the use of direct comparisons between production costs in farm management studies of regional competition.

Progress report on cost of production route in Choctaw County, Mississippi, 1925, L. E. Long and H. W. Reynolds (*Mississippi Sta. Bul. 237 (1926), pp. 23*).—A report for the calendar year 1925 of a study previously noted (E. S. R., 55, p. 181), based on records from 19 farms obtained in cooperation with the U. S. D. A. Bureau of Agricultural Economics.

The weighted average of total value of products per farm was $1,747.72, of farm income $824.98, and of value of operator's labor $312.86. The return on investment (farm income minus value of operator's labor) varied from −2.1 per cent to 28.2 per cent, averaging 12.2 per cent. The cost of producing the chief crops, butterfat, poultry products, and pork, varied as follows: Cotton from 3.5 to 16.3 cts., averaging 10.2 cts. per pound; corn 32 cts. to $1.52, averaging 75 cts. per bushel; oats 19 cts. to $1.09, averaging 41 cts. per bushel; lespedeza hay $1.61 to $48.47, averaging $4.61 per ton; butterfat 16 to 88 cts., averaging 41 cts. per pound; eggs 10.7 to 64.9 cts., averaging 19.7 cts. per dozen; chickens (meat) 14 cts. to $1.51, averaging 61 cts.; and dressed pork $2.95 to $25.33, averaging $10.65 per hundred pounds.

From 44.4 to 230.4 hours of man labor, averaging 104.5 hours, and from 22.1 to 91.9 hours, averaging 37 hours, of horse labor were used per acre of cotton; and 21.4 to 153.4 hours, averaging 41.6 hours of man labor, and 14.9 to 163 hours, averaging 33.8 hours, of horse labor per acre of corn. The cost per animal unit of maintaining work stock varied from 9.2 to 25.1 cts., averaging 13.9 cts., per hour of work.

Cost of producing winter wheat and incomes from wheat farming in Sherman County, Oreg., R. S. Washburn and H. D. Scudder (*U. S. Dept. Agr. Bul. 1446 (1927), pp. 40, figs. 12*).—This bulletin is based on data on the cost of the factors of production and farm earnings obtained by personal interviews, 450 records being obtained, divided nearly equally among the years 1920, 1921, and 1922. The area studied is dry-farmed, approximately 36 per cent of the average acreage per farm in 1922 being in winter wheat, 39 in summer-fallow, 4 in other crops, 19 in pasture, and 2 per cent in waste land. So far as cost

sible the data were reported in terms of physical requirements. The quantity requirements of labor and materials were analyzed, and the effect of differences in methods and practices on costs and returns were measured.

Tenure; distribution of livestock; farm area and capitalization; receipts, expenses, and earnings; quantity and value of products used on the farm; the cost and utilization of man labor, horse work, farm machinery, and their relation to the size of farm; costs by tenure; cash and noncash costs of production; variation in cost per bushel; and the relation of yields to costs are discussed.

Itemized estimates are included on the cost of production for 1923 and 1924, and suggested plans for the organization and management are given for a 640-acre farm, a 1,280-acre farm operated with horses, and a 1,280-acre farm operated with tractors.

Cost of using horses, tractors, and combines on wheat farms in Sherman County, Oreg., R. S. WASHBURN and H. D. SCUDDER (*U. S. Dept. Agr. Bul. 1447 (1926), pp. 44, figs. 12*).—The purpose of this study is to show the probable costs of using combines, horses, and tractors, and to present the important points to be considered in the selection of combines and motive power. The bulletin is based on data obtained in the study noted above. The kinds, amounts, costs, economy, efficiency, seasonal distribution, advantages and disadvantages, etc., of horse and tractor work, and the types of, and the cost and the advantages and disadvantages of using combines are discussed. Comparative costs are given for harvesting and threshing with horse and tractor-drawn combines; for harvesting and marketing bulked and sacked wheat cut with tractor-drawn combines; and for harvesting, threshing, and marketing wheat where combines and where headers and stationary threshers were used.

Incomes from farming and cost of apple production in the Shenandoah Valley, Frederick County, Va., C. R. SWINSON (*U. S. Dept. Agr. Bul. 1455 (1927), pp. 31, figs. 9*).—The study is based upon records for the period 1916–1920 from 32 general farms, on which less than 25 per cent of the receipts were from apples; 45 mixed farms, with 25 to 75 per cent of the receipts from apples; and 48 orchard farms, with 75 per cent or over of the receipts from apples. The labor income and return on farm valuation were $235 and 3.5 per cent, $618 and 4.9 per cent, and $2,443 and 9.4 per cent, respectively, for the 3 types of farms. The bulletin is devoted principally to presenting data on farm organization and the costs of production for the 48 orchard farms and to analyzing such data to determine the most effective form of organization from the standpoint of lowering costs and increasing net returns.

On the 48 orchard farms the labor income per farm and the return on farm valuation increased for each 1,000-bbl. production group from $292 and 3.2 per cent for the below 1,000-bbl. group to $9,627 and 15.3 per cent for the above 4,000-bbl. group. The average yield per acre also increased from 28 to 53 bbls., except for a small decrease in the 3,000 to 4,000 bbl. group. The fixed costs (interest, operator's labor, cost of keeping work stock, repairs, buildings, machinery, depreciation, taxes, insurance, etc.) and the variable costs (hired labor, fertilizer, spraying, and harvesting) decreased from $2 and $1.58 per barrel for farms having 50 acres or less of bearing trees and a production of 40 bbls. or less per acre to $1.04 and $1.50 for farms having over 50 acres of bearing trees and a production of over 40 bbls. per acre.

Increasing farm profits with more early potatoes in northern Indiana, M. H. OVERTON (*Indiana Sta. Bul. 305 (1926), pp. 28, figs. 13*).—The yields, costs of growing, returns from, quality of, markets for, marketing of, and the place of early potatoes on northern Indiana farms are discussed. It is estimated that 10,000 additional acres of early potatoes can be profitably grown, and that

after deducting the extra cash cost of from $120 to $130, 5 acres of earl potatoes will probably return $275 more for the extra 225 hours of man labo 65 hours of horse labor, and 12.5 tons of manure required over an equa acreage of corn.

Washington agriculture.—Part 6, Poultry. Part 7, Recommendation and resolutions (*Wash. State Col. Ext. Bul. 134 (1926), pts. 6, pp. 42, figs. 38 7, pp. 10*).—Data submitted to and recommendations and resolutions passed b the Economic Conference held at Tacoma, Wash., on August 30 and 31, 192 Part 6 of this bulletin is by J. S. Carver and W. D. Buchanan. Part 7 i in mimeographed form.

Adjusting agricultural production and distribution in the Clarksbur area to meet home market demands, W. W. ARMENTROUT (*West Virginia Sta Bul. 212 (1926), pp. 40, figs. 9*).—This bulletin is the second of the series pre viously noted (E. S. R., 52, p. 493) and presents the results of a study o food consumption in Clarksburg and its trade area and of farm productio in Harrison County, W. Va., made during the summer of 1925. The freigh shipments of the commodities, incoming and outgoing from Clarksburg, wer summarized from freight records of both car lot and less than car lot ship ments for the period June 1, 1924, to May 31, 1925. The estimates of com modities sold from farms were based on a canvass of 241 farms compris ing about 15 per cent of the farm land of Harrison County. Tables ar given showing quantities shipped in of potatoes, cabbage, onions, tomatoes strawberries, vegetables, apples, livestock, packing house products, poultry an eggs, dairy products, and concentrated feeds and hay, and the possibilitie of increased local production are discussed.

Agricultural progress in a typical Maryland community, J. E. METZGER (*Maryland Sta. Bul. 285 (1926), pp. 23–60*).—This study is based upon the records of the Enterprise Farmers' Club of Sandy Spring, Md., an association of approximately sixteen members which has existed since 1865. The association was formed "for improvement in agriculture upon the sociable principle of a mutual interchange of visits." It meets monthly at members' homes in rotation "to inspect the crops, stock, farm implements, and conveniences, and inquire into the modes of culture and general system of arrangement pursued by the member at whose house we may be. A free interchange of ideas upon agricultural subjects will be expected on the part of all, and if any member is making experiments which are likely to be useful or interesting, we shall take special care to notice their progress and results."

The practices, experiments, results, etc., of the members in crops, rotations, maintenance of fertility, dairying, livestock production, etc., are traced through the life of the club. Tables are given showing the prices and wages of different periods since the organization of the club and the date of the first use of modern farm machines by the members.

An outline of the New York State system of taxation, M. S. KENDRICK (*N. Y. Agr. Col. (Cornell) Ext. Bul. 152 (1926), pp. 21, figs. 4*).—In conjunction with work previously noted (E. S. R., 56, p. 686), a study is reported of sources and the apportionment of State and local taxes and the purposes for which each is expended. More than 76.3 per cent of the total levy in 1924 was on general property. The general property tax constitutes 22.44 per cent of the revenues of the State, 90.33 of the city, 98 of the county, 72.27 of the township, 99.85 of the village, and 100 per cent of school districts. The index numbers for general property levies have increased from 110 in 1915 to 230 in 1924 (1910–1914=100). Among the reasons for present-day high taxes are the great expansion of Government functions, high prices—the index number for wholesale prices in 1924 being 152 (1910–1914=100), and high wages—the index

number for union wages in 1924 being 233 (1910–1914=100). More State support of roads and schools, elimination of the State levy on real estate, increased return of taxes collected to local units, use of other taxes such as an increased income tax, gasoline tax, etc., and changes in the administration of the general property tax are suggested as methods of easing the tax burden.

Michigan farmers' tax guide, R. W. NEWTON (*Michigan Sta. Circ. 100 (1927), pp. 11*).—This gives information as to assessing property, levying and collecting taxes, and the sale and redemption of delinquent real estate, and also a farm tax calendar.

The McNary-Haugen plan as applied to wheat, A. E. TAYLOR, J. S. DAVIS, and E. M. BRAND (*Wheat Studies, Food Research Inst. [Stanford Univ.], 3 (1927), Nos. 4, pp. 177–234; 5, pp. 235–264*).—Leading proposals for farm relief in the United States have rested on the assumption that the unprosperous condition of American farmers is caused by the low prices of farm products, due to there being surpluses produced that must be sold abroad at prices which depress the prices of the entire crops. The favorite remedy proposed has been to segregate the exportable surpluses, sell them abroad for what they will bring, and maintain domestic prices, behind the tariff wall, on levels substantially higher than would prevail otherwise. The central features of what is designated the McNary-Haugen plan of farm relief, so far as they apply to wheat, "are the operations of a Federal board, seeking to maintain domestic prices at enhanced levels behind the tariff wall, to segregate the surplus over domestic requirements and sell it for what it will bring, and to distribute operating costs and losses among the growers by means of an equalization fee on each bushel sold."

The purpose of the two publications is to examine the way a measure based on the McNary-Haugen plan might be expected to work with respect to wheat. No discussion is made of the assumptions underlying the proposed measures, constitutionality, nor other controversial matters.

No. 4 discusses the operating problems and probable economic consequences that would have followed if either of the McNary or Haugen bills introduced at the Sixty-ninth Congress had become a law, the analysis being based upon the assumption that the American price would be maintained by means of a sufficiently high tariff at a price at least 50 cts. a bushed higher than the Canadian price. The purpose of the bills, the policies, problems, and results of the United States Grain Corporation during the war, the standard for the domestic price, price fixing, price differentials between different grades of wheat in different sections of the country, the sources and disposition of the operating funds, the fixing and collection of equalization fees, the continuation of trading in wheat futures, the problems of wheat and flour exports and of the carryover, the effect on prices of flour and feed, the effect on the cost of living, and the effects on acreage, world prices, and the American farmer are discussed.

The general conclusions reached by the authors are that administratively the measure is workable if (1) the board is composed of men who would command respect for experience, judgment, vision, and courage, and who would evince ability to work together, to draw upon needed technical skill in various lines, and to enlist and retain the support of the growers and the business interests involved; (2) there is reasonable assurance that the policy of Congress and the policies of the board would not be subject to arbitrary reversal or to vacillating execution; (3) adequate working capital is available for all emergencies; (4) the operations are conducted with a minimum of disturbance to current relationships and practices in the grain trade and milling industry, including operations on the grain exchanges; (5) effective working agreements are concluded with

elevators, mills, and exporters, as well as with cooperative marketing associations; and (6) a general disposition on the part of the board is to limit, rather than to magnify, its responsibilities.

The principal sources of danger of a breakdown are the possibilities that the board can not secure competent technical organization and managerial ability; that the board may be swamped with a large and relatively unsalable surplus in a year of coincidence of large domestic crop with large world crop and low wheat prices; that several years of successive large crops and low prices might so magnify the carryover and losses on exports and so increase the difficulty of collecting adequate equalization fees as to break the board under the burden of carrying charges and frozen purchases; and the dangers from vacillation in the board's policy, withdrawal of political support from Congress, and the collapse of the growers' confidence in the undertaking. The crucial point of the proposition is deemed to be that the adoption and success of the policy will result in the rapid expansion of wheat acreage, increase in exportable surplus, and a future net price little or no higher, and possibly even lower, under the operation of the scheme than if no such measures had been adopted.

The analysis in No. 5 is made on the basis that the present tariff on wheat, 42 cts. a bushel, will continue. The fundamental limitations upon price increases of wheat, due to the intrinsic milling superiority of Canadian hard spring wheat, the tariff, and the existing regional relationships within the American milling industry in connection with freight rates on wheats and flour and with the geographical distribution of wheat production, are discussed. Tables are given showing weekly from July 7, 1923, to June 26, 1926, the margins between Winnipeg prices, plus 42 cts., and Minneapolis prices on the following bases of comparison: (1) Futures prices; (2) top cash prices of No. 1 Manitoba Northern wheat at Winnipeg and No. 1 Dark Northern Spring wheat at Minneapolis; (3) low cash prices of No. 3 Manitoba Northern at Winnipeg and No. 1 Dark Northern Spring at Minneapolis; (4) high cash sales of the same grades; (5) cash closing prices of the same grades; and (6) high cash price of No. 3 Manitoba Northern and high quotations on the basis of the nearest future of No. 1 Dark Northern Spring wheat. The annual averages on bases 2 to 6 ranged from 7.8 to 15.1 cts., averaging 10.2 cts., in 1923–24; from 16.1 to 33.3 cts., averaging 21.7 cts., in 1924–25; and from 5.5 to 17.5 cts., averaging 12 cts., in 1925–26.

Conclusions are reached that (1) with the present tariff of 42 cts. a bushel the prices of American spring wheats at Buffalo, the natural import threshold for Canadian wheat, could not be raised, except in unusual years, by more than 10 or 12 cts. a bushel; (2) that at most other markets prices of spring and winter wheats could not be raised appreciably over increase in price of hard spring wheats at Buffalo without stimulating imports and disrupting regional competitive relations in the milling industry; and (3) that the slight advance in prices, partially offset by equalization fees, would hardly justify the experiment.

An addendum to No. 5 contains observations on the concessions made in the latest bills before the Sixty-ninth Congress to the opponents of the central features of the plan. The conclusion is reached that the proposed alternatives or supplements to the equalization fee—loans to cooperative marketing organizations and price insurance—would impose heavier responsibilities on the board and decrease its chances of success without promising larger price enhancement to growers.

Kentucky livestock auction sales organizations, E. C. JOHNSON (*Kentucky Sta. Bul. 270 (1926), pp. 211–256, figs. 18*).—The organization, method of operation, accounting methods, rates, yards and equipment, advantages and disadvantages, and the fundamentals for successful operation of livestock auction

sales organizations are described. The study is based on a survey of 10 of the 13 organizations in central Kentucky. From October 1, 1924, to October 1, 1925, 8 of these organizations held 367 sales, at which 244,025 sheep and lambs, 143,851 hogs, and 105,368 cattle and calves were sold, the gross sales amounting to $7,736,191.61. The costs per head in 5 organizations for which cost records were kept varied from 18.2 to 34.3 cts., averaging 22.7 cts., of which labor and salaries constituted 65.7 per cent, yard costs 18.9, office expenses 6.1, losses on livestock 6.2, and other costs 3.1 per cent. The average profits ranged from 2.4 to 13.3 cts. per head, averaging 6.7 cts.

Cooperative marketing and price control, O. B. JESNESS (*Kentucky Sta. Bul. 271 (1926), pp. 257–279*).—A general statement of the possibilities and limitations of cooperation in improving marketing and obtaining better prices for farm products.

The balance of trade in farm products, L. P. JEFFERSON (*Jour. Farm Econ., 8 (1926), No. 4, pp. 451–461*).—A report on one of a series of studies undertaken by the Massachusetts Agricultural College on the food supply of New England. Data are presented as to the food supplies consumed in the city of Fitchburg, Mass., the food demand, and the sources of supply. The study was made to ascertain the racial and national food preferences, the quantities of specific products required, and the quantities of various products supplied from local sources. Fitchburg had a population in 1920 of 41,029, of which, according to the State census of 1915, 35 per cent were foreign born and 43 per cent native born but of foreign parentage. The percentages of the dietary of various foods in 1919 were cereals 18.3, canned goods 2.05, dairy products other than milk and cream 0.53, eggs 2.3, fats 2.66, fish 0.96, fruits 9.85, meats 5.76, milk and cream 28.36, poultry 0.38, sugar 3.6, and vegetables 25.12. The percentages of different commodities received from local sources were eggs 36.4, fruits 20.5, meats 7.1, milk and cream 100, poultry 45.6, and vegetables 18.8.

Food costs and city consumers, C. E. ARTMAN (*Thesis, Columbia Univ., New York, 1926, pp. 171, figs. 13*).—A thesis submitted to Columbia University in partial fulfillment of the requirements for the degree of doctor of philosophy. It treats in detail investigations previously noted (E. S. R., 56, p. 387).

Crops and Markets, [January–February, 1927] (*U. S. Dept. Agr., Crops and Markets, 4 (1927), Nos. 1, pp. 32, figs. 3; 2, pp. 33–80, figs. 3*).—The usual tabulations, summaries, charts, and notes are given regarding crops, dairy products, cold-storage holdings, fruit and vegetable shipments, livestock and livestock products, prices and price movements of agricultural products, seeds, exports of grain, and world agriculture, formerly published in the Monthly Supplement to Crops and Markets (E. S. R., 56, p. 586). Special reports are included in No. 1 on the December 1 pig survey, and prices to jobbers and total shipments of 14 fruits and vegetables, 1926, while in No. 2 special tables and reports are given on the agricultural outlook for 1927; the numbers, value per head, and total value of livestock on farms, January 1, 1925, 1926, and 1927, with monthly prices, 1910–1927; cattle, sheep, and lambs on feed, January 1; monthly prices of dairy and poultry products, 1910–1927; number of persons employed per farm on farms of crop reporters, December 1, 1923–1926, and January 1, 1924–1927; monthly corn and hog ratios by States, 1924–1926; yearly farm wages and index numbers, 1910–1927, and the average wages by States for January, 1925–1927; stocks, production, uses, and grades of potatoes, January 1, 1927; statistical report of the livestock and meat situation, December and January to December, 1925 and 1926; and the tariff rates on representative agricultural products under the tariff acts of 1913, 1921, and 1922.

No. 2 also includes tables showing (1) prices of livestock and meats; (2) weights and prices of stockers and feeders, and receipts of dairy and poultry

products, and wheat, corn, and oats at stated markets; (3) prices of butter and cheese, prices to jobbers of fruits and vegetables, and carload prices of hay, straw, and feedstuffs at important markets; and (4) other data formerly published in the weekly issues of Crops and Markets (E. S. R., 56, p. 387).

The agricultural map of U. S. S. R. [trans. title], I. F. MAKAROV, edited by N. I. VAVILOV (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant Breeding), 1926, Sup. 28, pp. 90, pl. 1, figs. 18; Eng. abs., pp. 85–90*).—A map with explanatory text showing the acreage and distribution of different crops in the Union of Socialistic Soviet Republics.

The agricultural colonisation of the Zionist Organization in Palestine, A. RUPPIN, trans. by R. J. FEIWEL (*London: Martin Hopkinson & Co., 1926, pp. VIII+209, fig. 1*).—A brief history is given of the Zionist colonization, and the agricultural colonization policy of the Zionist Organization and the present state of the settlement are described. The points of dispute in the policy—individual or group settlement, extensive or intensive cultivation, settlement of immigrants with private means, the future system of administration, etc., are discussed.

International yearbook of agricultural statistics for 1925–26 (*Inst. Internatl. Agr. [Rome], Ann. Internatl. Statis. Agr. (Internatl. Yearbook Agr. Statis.), 1925–26, pp. XCVIII+558*).—This is one of a series previously noted E. S. R., 54, p. 289) and gives tables showing the territorial area, population, apportionment of areas, agricultural production, and numbers of livestock by countries; the area, production, and yield of each of the principal crops by countries and continents; the numbers of different species of livestock; the international trade in the chief agricultural products by countries and continents; the prices of various products; ocean freight rates on cereals and cotton; the production, exportation, and importation by countries of fertilizers and chemical products useful in agriculture; and the rates of exchange. Texts, notes, table headings, etc., are in English and French.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Workers in subjects pertaining to agriculture in State agricultural colleges and experiment stations, 1926–1927, M. A. AGNEW (*U. S. Dept. Agr., Misc. Circ. 87 (1927), pp. III+130*).—The usual annual list (E. S. R., 55, p. 288).

Agricultural evening school classes in dairying, C. LUKER (*Tex. State Bd. Vocat. Ed. Bul. 199 (1926), pp. 30*).—This bulletin is based on 2½ years' experience in organizing and conducting evening school classes dealing with different phases of the dairy industry that reached approximately 800 milk producers. The possibilities for such courses, the method of organizing, the methods and devices used in teaching, the supervision of practice, and the results are described.

What a poultry project should contain, H. L. SHRADER (*Poultry Sci., 5 (1926), No. 6, pp. 274–280*).—A critical discussion of extension projects with poultry.

Fruit tree and orchard judging, W. P. DURUZ (*California Sta. Circ. 309 (1927), pp. 27, figs. 3*).—Score cards for judging fruit trees and orchards, and directions for using such cards and for organizing and conducting judging contests are given.

Clothing and textiles, M. L. MATTHEWS (*Boston: Little, Brown & Co., 1926, rev. ed., pp. XII+180, figs. 83*).—This is a revision of a textbook entitled Sewing and Textiles, previously noted (E. S. R., 45, p. 697).

How to make and use an operating statement, W. POWELL (*N. Y. Agr. Col. (Cornell) Ext. Bul. 156 (1927), pp. 31, fig. 1*).—The making, analysis, and use of

an operating statement for a business as a whole and for departments of a business are explained by means of typical examples.

The relative merits of circles and bars for representing component parts, W. C. Eells (*Jour. Amer. Statis. Assoc., 21 (1926), No. 154, pp. 119–132, figs. 2*).—The results are given of an experiment made with a class of 93 to 97 students in general psychology to ascertain the relative ease, rapidity, and accuracy in reading circle and bar diagrams. The results show (1) that there is a slight advantage in favor of circles in ease and rapidity of reading; (2) that circle diagrams are read more accurately, both as regards number and size of errors, and that the accuracy of judgment increased with the number of subdivisions in the case of circles and decreased in the case of bars; and (3) that in judging parts in circles 25 per cent of the students considered areas, 23 per cent central angles, 51 arcs, and only 1 per cent chords, but there was no significant difference in accuracy of judgment by the different methods.

Further studies in the graphic use of circles and bars (*Jour. Amer. Statis. Assoc., 22 (1927), No. 157, pp. 31–39, figs. 8*).—This article consists of a discussion and criticism of the study noted above.

Part 1, A Discussion of the Eells' Experiment, by R. von Huhn, criticizes the methods used and reaches the conclusion that the circle may be preferable to the bar only where a single total with rather numerous component parts is to be shown and where the parts need to be presented not only singly but also in groups.

Part 2, Some Additional Data, by F. E. Croxton, presents the results of an experiment to test the accuracy of the judgment of observers with bar and circle charts showing 1:1½ and 1:4 ratios. These results show that of the 287 observers, 132 estimated correctly from the 1:1½ bar chart and 95 from the pie diagram, and 119 and 74, respectively, from the 1:4 bar chart and pie diagram.

Use of motion pictures in agricultural extension work, F. W. Perkins, H. Greene, and G. R. Goergens (*U. S. Dept. Agr., Misc. Circ. 78 (1926), pp. 22, figs. 10*).—Information is given for the use of agricultural extension agents and others regarding motion picture equipment, its operation, film programs, etc.

Motion pictures of the United States Department of Agriculture (*U. S. Dept. Agr., Misc. Circ. 86 (1926), pp. II+31*).—A list of films of this Department available for distribution and data on how to obtain them.

FOODS—HUMAN NUTRITION

Food and health, R. H. A. and V. G. Plimmer (*London and New York: Longmans, Green & Co., 1925, pp. [5]+64, pl. 1, figs. 11*).—This popular presentation of the essential principles governing the selection of food includes the scheme for the graphic representation of complete and incomplete diets noted previously (E. S. R., 56, p. 290).

Food and health manual for classes in nutrition, R. George (*Toronto: Canad. Red Cross Soc., pp. II+117, figs. 15*).—A manual on the essential principles of food and nutrition.

Nutrition laboratory, F. G. Benedict (*Carnegie Inst. Wash. Yearbook 25 (1925–26), pp. 139–150*).—This annual report contains, as previously (E. S. R., 55, p. 188), a brief outline of investigations in progress and abstracts of publications of the laboratory during the year, several of which have been noted from their original sources.

The relation of cooking to the study of the quality and palatability of

of particular value to those engaged in the studies of the quality of meat, deals with the physical and chemical changes occurring in meat on cooking and the effect of various factors on these changes, the most satisfactory methods of cooking meat for the purpose of judging its quality, and the various factors constituting what is known as palatability, with methods for evaluating these factors. Several references to the literature on the subject are included.

The art of cooking and serving, S. F. SPLINT (*Cincinnati: Procter & Gamble Co., 1926, pp. [4]+252, pl. 1, figs. 73*).—This small volume and the one noted below are published by the manufacturers of Crisco. Directions for table service with and without servants, selected recipes, and typical menus for the different seasons of the year are included, with many photographic illustrations, some in color.

A calendar of dinners with 615 recipes, M. H. NEIL (*Cincinnati: Procter & Gamble Co., 1925, 26. ed., pp. 233, figs. 22*).—This is chiefly a collection of menus, with accompanying recipes, for every day in the year. As in the preceding book, Crisco is the shortening agent used in all of the recipes. A description of the processes involved in the manufacture of Crisco is included.

Dental caries and pulp sequelae resulting from experimental diets, J. A. MARSHALL (*Jour. Amer. Dental Assoc., 14 (1927), No. 1, pp. 3–37, figs. 45*).—The particular object of the experimental work reported was a comparison of the changes produced in rats on deficient diets with those reported in the literature for dogs. The diet used for most of the work reported was one deficient in vitamin A, but furnishing an adequate supply of vitamin D in the form of irradiated lard and of vitamin B in yeast. On this diet enamel and dentin hypoplasia commonly occurring in the teeth of puppies on similar deficient diets were not noted nor was there evidence of caries in the teeth of the young rats, but on maturity a form of caries developed which resembled more closely the type found in adults than in children. Pulp lesions were sometimes found in teeth which did not show caries. The feeding of vitamin A after the development of caries did not check the progress of the decay.

The basal metabolism and the specific dynamic action of foods in children in various conditions of nutrition, A. F. MORGAN and G. D. HATFIELD (*Amer. Jour. Diseases Children, 32 (1926), No. 4, pp. 516–523*).—In connection with a nutritional study of children at the California State Schools for Deaf and Blind, basal metabolism determinations were made on 9 girls and 7 boys from 7 to 14 years of age. Of these, 10 were tested two or three times at intervals of a month or more.

The 6 children classed as of normal weight by the Baldwin-Wood standards for height and age had metabolic rates falling within ±10 per cent of the Benedict-Talbot standards of weight and surface area. Of the 4 children classed as underweight, 2 had nearly normal and the other 2 high metabolic rates. Of the 6 children classed as overweight, 3 had low, 2 normal, and 1 high metabolic rates. Three of the girls showed wider divergencies from the Benedict height standards (E. S. R., 53, p. 862) than from the older weight and surface area standards.

In an effort to determine whether leanness and fatness may not be connected with some peculiarity in response of the individual to the specific dynamic action of food, 4 boys aged 10 years, 2 of whom were distinctly overweight and 2 of normal weight, were tested for an increase in metabolism following meals predominating in carbohydrate and protein, respectively. Although the increase in metabolism after the protein meal was more than twice that following the carbohydrate meal, there were no distinctive differences between the increases of the overweight and the normal boys.

Chinese diet in the light of modern knowledge of nutrition, H. Wu (*Chinese Social and Polit. Sci. Rev., 11 (1927), No. 1, pp. 56–81, fig. 1*).—This discussion of the adequacy of the Chinese diet is based upon the dietary studies of middle-class families in north China reported by Adolph (E. S. R., 54, p. 591) and a similar study of the composition of Peking dietaries made by the author. The latter study included 35 families composed of 146 adults and 47 children. In estimating the adult units the children were reckoned as fractions of adults according to the energy requirement for their various ages.

The diets furnished an average of 2,960 calories and 85.9 gm. of protein per man per day, these figures being considerably higher than those reported in the north China study. The percentage distribution of the foods among the various types was as follows: Cereal products 44.6; legumes and beans 7.5; meat, fish, eggs, and milk 5.2; fruits and vegetables 36.1; oils, sugar, and starch 2.3; and other foods 4.4 per cent. The distribution among the different types of food of protein and calories was cereals 71.1 and 72 per cent, respectively, legumes 11.5 and 5, vegetables and fruits 3.6 and 3.7, starch 0 and 0.7, fats and oils 0 and 7.8, meat and fish 8.3 and 6, eggs 2.3 and 0.8, milk and cheese 0.06 and 0.06, and miscellaneous 3.1 and 4.1 per cent.

The author is of the opinion that the calorie value of the Chinese diet is ample according to American standards for body weight, but that, considering the low biological value of the chief sources of protein, the protein allowance represents the bare minimum. The diet is considered to be barely adequate in vitamins A and B and adequate in C. The supply of phosphorus and iron is thought to be adequate and that of calcium probably inadequate.

As the most practical means of improving the diet, the author recommends an increase in the use of eggs, bean products, green vegetables, and fruits, the use of slightly milled grains instead of highly refined products, and modifications in methods of cooking to conserve vitamins and minerals.

Further evidence that small quantities of copper, manganese, and zinc are factors in the metabolism of animals, J. S. McHargue (*Amer. Jour. Physiol., 77 (1926), No. 2, pp. 245–255, figs. 2*).—Rats confined to a synthetic diet and under conditions said to be the best that could be improvised at the time gave results which the author interprets as indicating that compounds of manganese more definitely and possibly copper and zinc also have important biological functions in animal metabolism. "It is assumed that the compounds of these elements as they occur in the natural state in green leaves and seeds of mature plants and the vital organs of animals have a much more active biological potency than could be expected from feeding equal proportions of a crystalline salt of these metals in a synthetic diet."

The nutritional value of oysters and other sea food, D. B. Jones (*Amer. Jour. Pub. Health, 16 (1926), No. 12, pp. 1177–1182, fig. 1*).—This is essentially a summary of studies conducted at the Bureau of Chemistry, U. S. D. A., on the vitamin content of oysters and the equality of the proteins of oysters, clams, and shrimps.

To overcome difficulties in weighing the oysters in the vitamin tests, the oysters were frozen and weighed before thawing. In the vitamin B studies both protective and curative tests were employed. In both 3.5 gm. of oysters proved to be nearly, but not quite, sufficient to provide the necessary amount of vitamin B. Calculated on the dry basis, this amount corresponds to 0.56 gm. daily. "On this basis, oysters compare favorably as a source of vitamin B with foods which are recognized as excellent sources of this dietary factor." The cure of xerophthalmia induced by vitamin A-free diets was used as the criterion for estimating vitamin A. On 3.5 gm. daily, the rats showed rapid improvement in the condition of the eyes and in the rate of growth. On 2 gm.

daily, recovery from xerophthalmia was equally rapid but resumption of growth was slow.

In the protein studies, the oysters and clams were heated to coagulate the protein and then dried and ground to a meal and the shrimp muscle was dried and ground without heating. The dried materials were used as the sole source of protein at a 9 per cent crude protein level and their growth-promoting properties determined by the gains in weight in a 100-day period and by the gains per gram of protein consumed. The gains made on the shrimp and clam diets were about the same and considerably higher than on the oysters. Expressed in grams per gram of protein consumed during a 6-week period, the average values were clam 2.05, shrimp 2.15, and oysters 1.27 gm. These results are thought to indicate that "the proteins of clams, shrimp, and oysters compare favorably with the proteins of other articles that are highly regarded for their nutritive value."

The distribution of some of the amino acids in shrimp muscle was found to be as follows: Cystine 1.78 per cent, arginine 10.24, histidine 3.78, lysine 7.60, tryptophane 1.21, tyrosine 4.88, aspartic acid 6.98, and glutamic acid 15 per cent.

Antirachitic content of canned oysters (*Wisconsin Sta. Bul. 388 (1926), pp. 124, 125*).—Preliminary studies by H. T. Parsons indicate that both raw and canned oysters contain vitamin D in appreciable amounts.

Biological food tests.—IX, Vitamin A in three varieties of cheese, A. F. Morgan (*Amer. Jour. Physiol., 78 (1926), No. 1, pp. 11–16*).—In continuation of the studies previously noted (E. S. R., 53, p. 62), the author reports that California cream cheese (Cheddar type) and Limburger cheese "appear to retain in an unusually concentrated form the vitamin A of the milk from which they are made." Imported Swiss cheese did not appear to be as rich in vitamin A. The evidence upon which these conclusions are based consisted of curative experiments conducted on only 4 or 5 rats for each cheese. The first two cheeses were fed in amounts of 1 gm. daily for 2 weeks, followed by 0.5 gm. daily. The Swiss cheese was fed in amounts of 0.5 gm. daily for 3 or 4 weeks, during which time there was no improvement, and then in amounts of 1 gm. daily. On the larger amount normal growth was secured, but the eye trouble was not cured in 3 out of 4 cases.

Losses of vitamin B in vegetables in cookery (*Wisconsin Sta. Bul. 388 (1926), pp. 125, 126*).—To supplement the studies of Peterson and Hoppert on the comparative losses of mineral matter from vegetables with different methods of cooking (E. S. R., 55, p. 87), the losses of vitamin B in string beans and cauliflower cooked by the same methods were determined by H. T. Parsons.

With string beans the greatest loss occurred when they were cooked in large amounts of water and the smallest losses when cooked in the pressure cooker. In the cauliflower studies the pressure cooker was not used on account of the strong flavor developed by this process. In the steam process the steam was allowed to escape for 5 minutes and then confined in the vessel for the next 10 minutes, under which conditions there was no discoloration and but little increase in flavor. As judged by curative tests, some losses of vitamin B took place with all the methods. When a large amount of water was used this loss amounted to about 30 per cent.

Comparison of the content of vitamin B in fresh yeast and in dried yeast prepared from it [trans. title], A. Scheunert and M. Schieblich (*Chem. Zelle u. Gewebe, 13 (1926), No. 1, pp. 79–86, figs. 5*).—The vitamin content of a commercial dried yeast prepared from waste brewery yeast by a process to remove the bitterness, followed by thorough washing and drying, was compared with that of the fresh yeast by the usual feeding experiments on young rats and protective experiments with pigeons on a polished rice diet. No appreciable

difference could be noted between the effect of the dried yeast and a comparable amount of the fresh in either case.

Studies in the physiology of vitamins.—IV, Vitamin B in relation to gastric motility, G. R. Cowgill, H. J. Deuel, jr., N. Plummer, and F. C. Messer (*Amer. Jour. Physiol., 77 (1926), No. 2, pp. 389–401, fig. 1*).—The experiments reported in this continuation of the series of studies previously noted (E. S. R., 54, p. 194) were planned for the purpose of determining whether the progressive loss of appetite characteristic of vitamin B deficiency in dogs is accompanied by any changes in the hunger contractions of the empty stomach.

Four dogs having permanent gastric fistulas were fed basal diets free from or extremely low in vitamin B (E. S. R., 46, p. 358) but adequate in other respects. From time to time the motility of the empty stomach was recorded by means of an inflated rubber balloon placed in the stomach and connected with a chloroform manometer and recording device. When the animals had lost their desire to eat, beef juice was administered but with no effect upon the appetite. Harris vitamin powder was then administered with prompt restoration of the appetite.

The tracings of the hunger contractions showed no remarkable changes in character in the early stages of the vitamin B deficiency but almost complete atony in later periods. The administration of vitamin B was followed by rapid improvement in the stomach musculature as shown by the regularity of muscle contractions.

In discussing the significance of these experiments, the authors conclude that to the list of conditions which have been demonstrated to produce gastric atony must now be added prolonged subsistence on a diet low in vitamin B. It is suggested that the lack of appetite during convalescence from certain diseases may be due to the same condition and should be taken into consideration by clinicians.

"It is difficult, when dealing with such a parallelism as has been described, to decide whether or not vitamin B maintains the desire to eat simply by aiding in the preservation of the normal gastric tone. The marked systemic manifestations characteristic of advanced cases of vitamin B deficiency suggest that the loss of the desire to eat in such cases is due as much to a generalized systemic disturbance as it is to an abnormal condition localized in the alimentary canal."

Fasting and rice disease in pigeons; the parallelism of loss of body weight, temperature, and respiration rate; the absence of B vitamins from the cortex of the beef suprarenal, O. W. Barlow (*Amer. Jour. Physiol., 78 (1926), No. 2, pp. 322–324, fig. 1*).—This study is of interest not only in demonstrating that extracts of suprarenal cortex do not contain appreciable amounts of antineuritic vitamin, but also that the decreases in body weight, temperature, and respiration of pigeons on an exclusively polished rice diet are similar to, although more gradual, than the corresponding changes in fasting pigeons.

Vitamin studies, II [trans. title], Z. Wierzchowski (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Pulawach (Mém. Inst. Natl. Polon. Écon. Rurale Pulawy), 5 (1924), A, pp. 15–69, figs. 8; Fr. abs., pp. 62–69*).—In continuation of the investigation previously noted (E. S. R., 49, p. 160), an extensive study is reported of the nitrogen metabolism of polyneuritic pigeons as compared with normal and starving pigeons. The conclusion is drawn that the pathological symptoms induced by a deficiency of vitamin B are due in part to the loss of the power of assimilating digested food and in part to the secondary effects produced in the organism by inanition. Vitamin B is considered an indispensable factor of

assimilation, particularly of protein material. When vitamin B is lacking, the organism is considered to lose its faculty of synthesizing the specific proteins from the amino acids furnished by the digestive organs and the metabolism to acquire more and more a character corresponding to inanition. The vitamin is considered, however, not to take part in the metabolism of the tissues during inanition.

Effects of diet during pregnancy on development of rickets in the offspring, J. V. Greenebaum, T. K. Selkirk, F. A. Otis, and A. G. Mitchell (*Jour. Amer. Med. Assoc.*, 87 (1926), No. 24, pp. 1973–1976, figs. 2).—In this investigation the diets of 25 women who previously had bad rachitic children were supplemented during the last three months of pregnancy by vegetables, cereals, fruit, eggs, and milk in amounts designed to bring the quality and quantity of the daily food intake up to the proper standards for pregnant women. The standards set were 1 gm. of calcium, 1.45 gm. of phosphorus, and 0.015 gm. of iron, with a total of 2,500 calories daily.

In but few cases were all of the standards reached, but striking improvements were made, as shown by the daily dietary records obtained from each subject by the visiting dietitian in the short period of preliminary observation and during the experimental period proper. It is thought that the standard of calcium was reached, but that the phosphorus intake was slightly below and the iron and caloric intake definitely below the standards set. After delivery the dietary supervision was discontinued and the women for the most part returned to their former dietary habits. None of the babies received cod-liver oil during the eight months of observation, which included clinical and X-ray examination, and in some cases calcium and phosphorus determinations of the blood.

Of the 22 babies under observation, 16 showed rickets on clinical examination and 19 on X-ray examination by the eighth month. One did not develop rickets at all and 1 not until after the eighth month. The diet of the mothers of these 2 babies had most closely approximated the standard set. The degree of rickets appeared to be more closely correlated with the calorie deficiencies of the diet of the mothers than with the mineral intake. The babies whose mothers received a low intake of calories had a higher percentage of the more severe grades of rickets than those whose mothers received a higher caloric intake. None of the babies whose mothers had a caloric intake higher than 1,700 developed more than mild rickets at any time.

In the few cases in which blood examinations were made, the inorganic phosphorus of the mothers' serum during pregnancy was normal while that of the babies' serum was below normal. The calcium content of the serum of both mothers and babies was normal. The calcium content of the breast milk was frequently low but the inorganic phosphorus uniformly normal.

"Our experiment would indicate that if the diet of the mother during the last three months of pregnancy can be made approximately correct in caloric and mineral intake, while it will not prevent rickets, it will have a controlling influence on the development of the disease in her offspring."

Studies on experimental rickets.—XXVIII, Does vitamin D pass into the milk? E. V. McCollum, N. Simmonds, J. E. Becker, and P. G. Shipley (*Amer. Jour. Diseases Children*, 33 (1927), No. 2, pp. 230–243).—To determine whether it is possible for nursing women to increase the vitamin D content of their milk by taking cod-liver oil and, if so, when the treatment should begin and how long it should be continued, a series of feeding experiments in continuation of the studies previously noted (E. S. R., 56, p. 296) was conducted upon female rats, with the addition of suitable amounts of cod-liver oil to a basal diet supposedly adequate in all respects except for a deficiency in vitamins A and D. A paral-

purpose of determining whether a diet complete in every respect except vitamin D is capable of producing milk with protective value against rickets. The entire time covered in any one experiment extended from about a month before mating until the young were eating the mother's diet, but the individual periods were varied to cover one or all of the periods before mating and during pregnancy and during lactation before and after the young eat of the mother's food.

When the rats were fed cod-liver oil before mating, during pregnancy, and during the first two weeks of nursing, considerable protection against rickets in the young was afforded, but not as much as when the young were continued on the cod-liver oil ration. When the cod-liver oil was fed only during the first two weeks of the nursing period, there was very little protection against rickets. No protection was afforded by the butterfat diet.

These experiments are thought to demonstrate that the vitamin D of cod-liver oil does pass into the mother's milk, but that to insure a considerable amount of this vitamin the diet should be supplemented by cod-liver oil during pregnancy as well as lactation.

Imparting antirachitic properties to foods (*Wisconsin Sta. Bul. 388 (1926), pp. 121, 122*).—A summary of the studies of H. Steenbock and his coworkers on the antirachitic vitamin and its synthesis in food materials by exposure to ultra-violet light.

Note on the anti-rachitic action of irradiated sawdust, O. ROSENHEIM and T. A. WEBSTER (*Biochem. Jour., 20 (1926), No. 6, pp. 1340, 1341*).—Further proof of the part played by sawdust bedding in promoting growth and calcification of bones in irradiation experiments, as noted by Hume and Smith (E. S. R., 56, p. 295), is afforded by a demonstration that a resinous matter extracted from sawdust by chloroform acquires antirachitic properties on irradiation.

A simple method for deriving the formula for a diabetic diet, W. S. COLLENS and D. H. SHELLING (*Jour. Amer. Med. Assoc., 88 (1927), No. 6, p. 396*).—The authors have devised a chart for the rapid calculation of diabetic diets from the caloric requirements of the patient and the percentage of total calories to be given in the form of protein. The diets are based on the Woodyatt ketogenic-antiketogenic ratio of 1.5 : 1.

MISCELLANEOUS

Thirty-fourth Annual Report [of Arizona Station, 1923], J. J. THORNBER ET AL. (*Arizona Sta. Rpt. 1923, pp. 431–510, figs. 13*).—This contains the organization list, an administrative report on the work and publications of the station, a financial statement for the fiscal year ended June 30, 1923, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue.

Report [of] South Mississippi Branch Experiment Station, 1926, E. B. FERRIS and W. S. ANDERSON (*Mississippi Sta. Bul. 238 (1926), pp. 18*).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Report [of] Raymond Branch Experiment Station, 1926, H. F. WALLACE (*Mississippi Sta. Bul. 240 (1926), pp. 16*).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Gleanings from science: Annual report of the director, [Wisconsin Station, 1925–1926], H. L. RUSSELL, F. B. MORRISON, and W. H. EBLING (*Wisconsin Sta. Bul. 388 (1926), pp. 147, figs. 40*).—This contains an account of the activities of the station, a list of the station publications of the biennium, and a financial statement as to the Federal funds for the biennium ended June 30, 1926. The experimental features not previously reported are for the

NOTES

Arizona University.—A portion of the basement of the agricultural building has been remodeled to provide greater space for the soil physics laboratory.

Arkansas University and Station.—Under plans drawn by the department of agricultural engineering, the department of horticulture is erecting a building on the station farm for packing fruits, in which mechanical graders will be used and the various kinds of packs will be demonstrated. The building will also be available for packing schools.

Michigan College and Station.—The 1927 Junior Farmers' Week was held May 5 and 6. Over 1,600 students from the vocational agricultural high schools participated, an attendance exceeding that of the previous year. The main events of the program were the livestock and crops judging contests. An evening banquet was attended by 1,100 boys and girls, who were addressed by Governor Fred Green and President K. L. Butterfield.

C. H. Spurway, research associate in soils, has recently developed a water soluble test for phosphorus in the soil, somewhat similar to that used in the Soiltex soil reaction test devised by him about three years ago. The phosphorus test is being given further trial before being placed on a production basis.

New appointments in extension work include O. I. Gregg as specialist in landscape architecture, J. W. Sims to succeed O. B. Price as soils specialist, and R. V. Gunn and Arthur Howland as specialists in economics.

Minnesota University.—The corner stone of the new plant industry building was laid March 22.

Cornell University.—An act was passed by the last legislature authorizing the trustees to contract for the foundations for the new plant industry building at a cost of $100,000. Funds for this portion of the building are available from earlier appropriations for the building program, so that it is expected to complete the foundations this summer. The total cost of the building is estimated at about $1,250,000. Accommodations will be provided for the departments of botany, plant pathology, pomology, floriculture, and plant breeding.

Dr. R. A. Emerson, head of the department of plant breeding, was recently elected a member of the National Academy of Sciences.

Pennsylvania College and Station.—According to a note in *School and Society*, appropriations totaling for the biennium $4,234,500, of which $1,000,000 is for new buildings and plant repairs, were made by the last legislature. The funds provided included $2,181,000 for general college maintenance, $403,500 for agricultural research, and $650,000 for agricultural and home economics extension.

Utah College and Station.—The last legislature authorized the establishment of two experimental farms, one in Carbon County and the other on the peat lands of Sanpete County. Le Moyne Wilson of the class of 1927 has been appointed superintendent of the latter farm.

R. J. Becraft, assistant professor in charge of range management in the college and station, has resumed his range management investigations after a year's botanical study at the University of Chicago. Tracy H. Abell, assistant professor of horticulture and assistant horticulturist, has resigned to take up advanced study.

Beginning July 1, Dr. Joseph A. Geddes, professor of sociology, is to undertake rural life studies, and Dr. F. B. Wann, associate professor of botany, is to conduct some investigations in plant physiology.

Wisconsin University and Station.—The Chicago Medical Milk Commission has indicated to the regents of the university its willingness to continue the industrial fellowship founded two years ago and to increase the allocation of funds to $4,400 for the year. This fellowship was founded for the purpose of studying the sanitary significance of streptococci in milk and milk products.

Two years ago the Chicago City Board of Health threatened to exclude several certified dairies in Wisconsin from the Chicago market because of the presence of certain streptococci in these supplies. This ruling was based on the supposition that all hemolytic (blood dissolving) streptococci were potentially dangerous in that they were regarded as capable of producing septic sore throat (tonsilitis) in man. In view of the apparent improbability that herds subject to close veterinary inspection and seemingly free from disease could be the cause of this disease in man, the certified milk producers subscribed to a fund which would enable a closely controlled scientific study to be made.

Dr. J. Howard Brown of Johns Hopkins University, W. D. Frost, and Miss Myrtle Shaw. working on this subject under the auspices of this medical industrial fellowship, have succeeded in perfecting differential culture methods which have enabled a separation to be made between streptococci of bovine and human origin. In an examination of over 1,200 cows made during the last 18 months, only 4 cows were found in certified milk herds which carried the streptococcus capable of causing human sore throat. Four additional cows have been found in other than certified herds in which this germ of human significance was found in milk.

The more refined methods of differentiation thus developed have added materially to a more accurate understanding of the relation between these blood-dissolving streptococci in the udder capable of producing infectious garget and the germ capable of producing septic sore throat in man.

A New Jersey firm of manufacturing chemists specializing in medical supplies has just given to the College of Agriculture $1,500 to establish an industrial fellowship. This fellowship will enable a study to be made on the relation of wheat germ oil to vitamin E and iron assimilation. Miss E. C. Van Donk has been appointed fellow under this foundation.

Dr. A. C. Merrick, assistant in veterinary science, resigned March 1 and was succeeded by Dr. H. J. Fiege.

Office of Experiment Stations.—Henry C. Waterman of the Bureau of Chemistry, U. S. Department of Agriculture, has been appointed associate chemist and will have charge of the abstracting for *Experiment Station Record* in the sections of agricultural and biological chemistry and soils and fertilizers.

Blandy Experimental Farm, University of Virginia.—In the development of this farm, which was bequeathed to the university by the late Graham F. Blandy, the appointment has been recently announced of Dr. Orland E. White, curator of plant breeding and economic plants at the Brooklyn Botanic Garden, as professor of agricultural biology and director of the farm. Five research fellowships have been established, two of $1,000 each and three of $500 each, to which graduates from standard colleges who have majored in biology or agriculture will be eligible. Appointees are expected to register in the graduate department of the university and take work leading toward a higher degree.

Shade Tree Investigations at Yale University.—According to a note in *Science*, facilities have recently been provided at Yale University for work on

shade tree diseases. R. P. Marshall of the Office of Forest Pathology, U. S. Department of Agriculture, has been placed in charge of these studies, which will be carried on by the botanical department of the university in cooperation with this department and with the financial support of a commercial tree expert company.

Guggenheim Memorial Fellowships.—Announcement has recently been made of the 1927 awards of 54 fellowships under the John Simon Guggenheim Memorial Foundation. Of these fellowships three have been granted to members of experiment station staffs. One of these is Dr. William H. Eyster of the Maine University and Station, who is to study the physiology of the chloroplastid pigments, using genetic strains of *Zea mays* which vary in the amounts and proportions of the different chloroplastid pigments from a complete absence of one or more pigments to a full complement of all, principally with Dr. Richard Willstaetter of Munich and Dr. Otto H. Warburg of the Kaiser Wilhelm Institute of Biology in Berlin. A second fellowship was granted to Dr. Rodney B. Harvey, associate professor of plant physiology and botany and associate plant physiologist in the Minnesota University and Station, for an investigation of the effects of low temperatures on plants, principally at the low temperature station for research in biochemistry and physics at Cambridge University, England, and for a survey of work on the winter hardiness of plants at the Swedish Plant Breeding Station at Svalöf and the Institute of Applied Botany and Plant Improvement at Leningrad. The third fellowship has been granted to Dr. Richard Bradfield, associate professor of soils in the Missouri University and Station, who will work with Dr. Herbert Freundlich at the Kaiser Wilhelm Institute in Berlin, giving special attention to the principles involved in the purification of colloids by electrodialysis.

Mexican Agricultural Schools.—According to a note in *School and Society*, three new central agricultural schools are to be established during 1927 by the Mexican Government under a program looking toward the maintenance of an agricultural educational center in each State of the Republic. Construction was to be begun in March on the schools located near Atlixco, State of Puebla, Jiménez, State of Chihuahua, and Tenancingo, State of Mexico.

New Journals.—*Protoplasma*, an international journal of the physical chemistry of protoplasm, is being issued from time to time under the editorship of Josef Spek of Heidelberg and Friedl Weber of Graz with the special collaboration of Robert Chambers of New York and William Seifriz of Philadelphia. Among the four original articles in the initial number is one by W. A. Beck entitled Cane Sugar and Potassium Nitrate as Plasmolysing Agents. Several abstracts and bibliographies are also given.

Chinese Economic Journal is being issued monthly in English by the Chinese Government Bureau of Economic Information, replacing the *Chinese Economic Monthly*. The initial number contains several articles of agricultural interest, including Shop Credit for Farmers, by P. C. Hsu; The Soybean as Human Food, by A. A. Horvath; Farms in Soochow; and Flour Mills in Peking.

The Social Service Review, edited by the faculty of the Graduate School of Social Service Administration of the University of Chicago, is being issued quarterly. The initial number contains several original articles, together with book reviews, abstracts of public documents, notes, etc. Among the original articles may be mentioned The Budget of the Unskilled Laborer, by L. Houghteling.

EXPERIMENT STATION RECORD

VOL. 56 JUNE ABSTRACT NUMBER No. 9

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Chemistry and home economics, R. A. GORTNER (*Jour. Home Econ., 18 (1926), No. 11 pp. 613–619*).—This paper, presented at the 1926 meeting of the American Home Economics Association, emphasizes the close relationship of chemistry to the problems of home making, particularly in the study of foods and of textiles and the value of cooperative research in the solution of these problems. "The scientific study of home making is just beginning. It will undoubtedly develop its own problems and its own technique for their solution, but the tools which it must use will in a large measure be derived from those basic sciences which underlie all natural phenomena, mathematics, physics, and chemistry."

New aspects of the chemistry of the oils and fats, J. C. DRUMMOND (*Jour. Soc. Chem. Indus., 45 (1926), No. 53, pp. 994–999, figs. 2*).—A general discussion of the significance of the nonsaponifiable fraction of fats and oils as the source of fat-soluble vitamins, the ovarian hormone, and the hydrocarbon squalene.

Oxidation and hydrolysis of light wood oil, P. O. POWERS, A. LOWY, and W. A. HAMOR (*Indus. and Engin. Chem., 19 (1927), No. 2, pp. 306–308, figs. 3*).—The combined lightwood oils from the distillation of hardwoods, as obtained (1) in the steam distillation of the settled tar, (2) from the refined pyroligneous acid in the copper stills, and (3) from the weak methanol distillate of the lime lee stills, were fractionated, and the products obtained by oxidizing the fractions boiling below 195° C. and by hydrolyzing them with lime were studied. The higher boiling fractions have found some use, but most of the oil produced is used as fuel. The fractions examined were free from nitrogen, sulfur, and halogens, and gave qualitative tests for the presence of aldehydes, ketones, esters, acids, furfuraldehyde, phenols, and unsaturated compounds.

Various oxidizing agents were tried, including nitric acid in concentrations from 6 to 20 per cent. The best results were obtained with 6 per cent boiling nitric acid, which gave in 16 hours a yield of 38.6 per cent total organic acids, 26.6 per cent being volatile. Vanadium pentoxide effectively catalyzed the oxidation of the oils with 9 per cent nitric acid. Blowing air through the mixture did not improve the yield of acids, and it removed the lower boiling fractions. The higher concentrations of nitric acid produced side reactions. At 70° the acid hydrolyzed the esters in the oil, being itself very slowly destroyed; at 80° the nitric acid was destroyed with the oxidation of the oil.

When the oil was boiled with an equal volume of water and a slight excess of lime, the products were principally methanol and calcium acetate from the lower boiling fractions of oil. The calcium salts from the fraction of oil boiling

between 160 and 195° contained principally salts of higher acids, including propionate and butyrates. The methanol obtained in the lime treatment contained ketones but no higher alcohols.

Observations on the oxidizing systems of fruits, W. V. CRUESS and W. Y. FONG (*Fruit Prod. Jour. and Amer. Vinegar Indus., 6 (1926), No. 3, pp. 13–15*).—Using the terminology of Overholser and Cruess (E. S. R., 50, p. 409), complete oxidase was satisfactorily detected in fruit flesh and skins by means of a 0.5 per cent solution of benzidine in 50 per cent ethyl alcohol, the positive indication consisting of the formation of a blue to purple color. This is not readily confused with natural fruit tissue color changes. If the color develops only on adding hydrogen peroxide, peroxidase only is indicated. Active catalase is indicated by the evolution of molecular oxygen from hydrogen peroxide. The benzidine tests are negative with thoroughly boiled fruit juice or flesh, minimizing the risk of positive reactions from nonenzymic oxidation. Guaiac tincture was found erratic in behavior, its reaction being capable of confusion with natural fruit color changes. Organic peroxide was detected by means of an acetic acid-starch-potassium iodide reagent.

In tests of 17 California fruits and fruit products the darkening of juices and of cut fruit surfaces was found in general to be most rapid in those fruits and juices giving a strong peroxidase reaction and a strongly positive reaction for chromogens (tanninoid substances turning brown on oxidation) with ferric chloride; e. g., Bartlett pears, Royal Anne cherries, Newtown apples, and avocados. Oranges and apricots darkened slowly and gave only faint ferric chloride reactions. The pH of the juice markedly affected the inactivation temperatures, as indicated by experiments, among others, in which juices adjusted to about pH 3 and about pH 5, respectively, were heated at 76° C. for from 15 to 25 minutes. Juices heated at pH 3.1 and 3.5 showed no peroxidase or organic peroxide, while those heated at pH 5.0, 5.2, and 5.5 gave positive tests. Even unheated juices gave negative reactions after standing at pH 2 to pH 3. The critical point on the alkaline side was found to be about pH 10 to 11. In fresh or dried apricots the oxidizing system was destroyed by heating about 3 minutes in live steam, and oxidation was inhibited temporarily in apricot juice by 60 mg. per liter of free SO_2, and permanently by adding 1,600 mg. per liter of SO_2 and subsequently neutralizing with $NaHCO_3$. It is suggested that high SO_2 concentrations, subsequently reduced below the legal maximum, might be used to produce fruit which could be dried without either darkening or illegal SO_2 content.

A study of gelatin viscosity and related problems, M. BRIEFER and J. H. COHEN (*Indus. and Engin. Chem., 19 (1927), No. 2, pp. 252–257, figs. 10*).—Theories regarding the structure of gelatin jellies are discussed, and experiments on the viscosity of gelatin solutions as affected by time and temperature of standing and by agitation are reported. The most satisfactory conditions for the viscosity determination in gelatin testing were found to be a temperature between 40 and 45° C., and a gelatin concentration of 10 per cent.

Water-resistant animal glue, F. L. BROWNE and C. E. HRUBESKY (*Indus. and Engin. Chem., 19 (1927), No. 2, pp. 215–219, figs. 4*).—The experiments described were based on the theory that the constant temperature gelation rate of an animal glue containing formaldehyde is a function of the free formaldehyde concentration. To secure a thorough final tanning of the glue, and at the same time to retain a long working life, formaldehyde polymers, hydrolyzable formaldehyde compounds, and adsorption complexes of formaldehyde were added in varying amounts to preparations made by soaking 100 gm. of ground glue in 225 to 250 cc. of cold water and melting at about 60° C. after complete

imbibition of the water. The derivatives used included commercial paraformaldehyde, α-polyoxymethylene, β-polyoxymethylene, mixture β- and γ- polyoxymethylenes, hexamethylenetetramine, formaldehyde-aniline, formaldehyde-urea, formaldehyde-starch, CH_2O adsorbed by charcoal, and CH_2O adsorbed by silica gel.

Most of these combinations improved the water resistance of the glue quite markedly, as indicated by the standard test of the Forest Products Laboratory, applied to panels soaked two days and tested to destruction while still wet, and the working life was in most cases long enough to be practicable. The addition of acids was found in general to lengthen, and the addition of alkalies to shorten the working life. Too much acid decreased the water resistance of the hardened glue. A glue of practicable life and possessing a water resistance sufficient to meet the requirements of the Navy casein glue specifications may be made by adding to animal glue as ordinarily prepared 10 parts by weight of paraformaldehyde and 5.5 parts of oxalic acid for each 100 parts of dry glue. The oxalic acid of this formula, sufficient to produce the maximum working life (7 to 9 hours) attainable with this acid, does not weaken the water resistance of the product. The water resistance of joints made with paraformaldehyde-containing glues was found to develop slowly, a curve showing an increase in breaking load per square inch from about 20 lbs. after 2 days to about 160 lbs. after 17 days. Temperature effects and some other factors were also studied.

Effect of hydrogen ion concentration upon the rate of destruction of vitamin B upon heating, H. C. Sherman and G. W. Burton (*Jour. Biol. Chem., 70 (1926), No. 3, pp. 639–645*).—The rate of destruction of vitamin B on heating as related to H-ion concentration has been studied quantitatively under conditions making possible a comparison of the relative effects of temperature and increased alkalinity (increased pH). Tomato juice, the medium used in a previous study by Sherman and Grose of the destruction of vitamin B by heat (E. S. R., 51, p. 461), was heated at 100° C. for 1 hour and 4 hours, respectively, at its natural reaction, pH 4.28, and also at pH 5.2, 7.9, 9.2, and 10.9, and the content of vitamin B measured by the usual feeding experiments on young rats, using the technique of Sherman and Spohn (E. S. R., 51, p. 368).

The changes in reaction of the medium resulted in successive increases in the destruction of the vitamin. This destruction began before alkalinity was reached, thus showing that the factor responsible was an increase in the proportion of OH-ions to H-ions on either the acid or alkaline side of neutrality. A change in H-ion concentration from pH 4.28 to 5.2 increased the rate of destruction to about the same extent as noted in the study of Sherman and Grose with an increase of temperature from 100 to 110°, and a change from pH 4.28 to 7.9 to a greater degree than a change of temperature from 100 to 130°.

Of the total initial amount of vitamin B, the percentages destroyed by 1 hour of heating at 100° were as follows: About 10 per cent at pH 5.2, from 30 to 40 per cent at pH 7.9, from 60 to 70 per cent at pH 9.2, and from 90 to 100 per cent at pH 10.9. Heating for 4 hours at 100° resulted in a destruction of about 20 per cent at pH 4.28, 31 per cent at pH 5.2, and 70 per cent at pH 7.9.

"In these experiments, oxidation does not seem to have played any appreciable part in the observed destruction of vitamin B. It is more probable that the vitamin was destroyed either by an hydrolysis or by intramolecular rearrangement, and that in either case the destruction reaction was catalyzed by hydroxyl ions. Change in the ratio of hydrogen to hydroxyl ions influences the rate of destruction in the same manner whether the pH of the solution were on the acid or on the alkaline side of neutrality, i. e., the rate

of destruction increased both by reducing the acidity of an acid medium, and by increasing the alkalinity when the medium had already been made alkaline. In other words, on both sides of neutrality, the rate of destruction of the vitamin was a function of the pH of the medium in which it was dissolved."

Significance of the occurrence of manganese, copper, zinc, nickel, and cobalt in Kentucky blue grass, J. S. McHargue (*Indus. and Engin. Chem., 19 (1927), No. 2, pp. 274–276, fig. 1*).—The bluegrass region soils are richer in copper, manganese, and other metals than other parts of the State, and the luxuriant growth of the bluegrass is attributed principally to this cause. Analyses of young bluegrass blades are adduced in support of this view. Sand culture experiments are also reported, in which were supplied (1) the 10 elements usually recognized as essential, (2) the 10 elements plus manganese, and (3) the same, plus both manganese and copper. Experiment 2 showed nearly twice the apparent growth of experiment 1, and experiment 3 showed distinctly better growth than experiment 2.

Volumetric analysis, I, J. M. Kolthoff (*Die Massanalyse. Berlin: Julius Springer, 1927, pt. 1, pp. XII+254, figs. 20*).—This is the first or theoretical section of a monograph on volumetric analysis, and deals in a comprehensive way with the modern chemical physicochemical theory of acid-base, oxidation-reduction, and precipitation reactions employed in volumetric analyses, together with the related subjects of indicators for all types of titration, including "adsorption indicators," titration errors, reaction velocities, adsorption phenomena in precipitation reactions, the volumetric methods of organic chemistry, the stability of reagent solutions, etc. Tables giving the values of K_w at various temperatures, dissociation constants of important acids and bases, solubility products of certain salts and alkaloids, some oxidation-reduction potentials, and other data are included.

Centrifuging as a substitute for filtration and calcination in the determination of tin and lead in their alloys [trans. title], M. Foà (*Gior. Chim. Indus. ed. Appl., 9 (1927), No. 2, pp. 69, 70*).—With an alloy of low tin content, heat a 5-gm. sample, either finely divided or, preferably, in thin laminae, with 30 cc. of nitric acid of specific gravity 1.4 in a beaker covered with a watch glass. After the reaction has begun, add 15 cc. of water drop by drop down the wall of the beaker, and permit the reaction to complete itself, about 15 minutes being required. Remove the liquid and precipitate to a weighed centrifuge bottle, transferring the precipitate quantitatively with about 50 cc. of boiling water. Shake the liquid in the bottle to dissolve the lead nitrate separated in the reaction. Centrifuge at about 3,000 r. p. m. for 3 minutes. It is of the greatest importance to stop the centrifuge smoothly and to avoid shaking in removing the bottles. Carefully decant the clear supernatant solution and pour about 70 cc. of boiling water into the bottle, shaking thoroughly to break up the deposit adhering to the glass. Repeat the centrifuging and decantation until a drop of the centrifuged liquid on potassium iodide paper gives no test for lead. Two or three washings should be sufficient. After decanting the last washing, dry the bottle to constant weight in an oven at 110° C.

The lead is precipitated from the united washings as sulfate and similarly determined by means of the centrifuge.

For alloys of high tin content, 0.5-gm. samples are taken, treated with nitric acid of specific gravity 1.2, and centrifuged as above after allowing 10 minutes for the completion of the reaction.

In an alloy containing 2.50 per cent of tin, 2.510, 2.507, and 2.505 per cent were found by the method described. With 50 per cent of tin in the alloy less satisfactory results were obtained: 50.89, 50.76, and 50.50 per cent. The method

is much quicker than either the electrolytic method or the ordinary gravimetric procedure. Volumetric methods were not found satisfactory.

The determination of very small quantities of iron, H. L. SMITH and J. H. COOKE (*Analyst, 51 (1926), No. 607, pp. 503–510, fig. 1*).—This is a modification of the colorimetric method of Stokes and Cain,[1] who concentrate the ferric thiocyanate formed in aqueous solution by extracting with 5:2 amyl alcohol-ether. In adapting this principle to the determination of 5 parts or less per million of iron, it was found necessary to purify the best nitric acid and potassium or ammonium thiocyanate available. With this precaution, and using color standards prepared from solutions of known iron content, 0.001 mg. of iron per gram could be determined in silica. Hydrofluoric acid redistilled in platinum was required, however, and in the presence of large amounts of bismuth, which prevented the normal coloration in nitric acid-aqueous solutions, hydrochloric acid had to be substituted for nitric acid. High concentrations of zinc also prevented full development of the color, but good results were obtained by extracting the iron as ferric chloride from the hydrochloric acid solution of zinc compounds and completing the determination on the ether-free extract in the usual nitric acid-aqueous solution, followed by ether-amyl alcohol extraction. A modified Soxhlet extractor for separating ferric from zinc chloride is illustrated.

Determination of total nitrogen, nitrate-nitrogen, and total nitrogen not including nitrate-nitrogen: Further observations on a modification of the Official salicylic-thiosulphate method, E. R. RANKER (*Ann. Missouri Bot. Gard., 13 (1926), No. 4, pp. 391–424, figs. 3*).—The following procedure,[2] recommended to replace the Official thiosulfate salicylic acid method, was studied with reference to its accuracy as applied to the determination of total nitrogen, including nitrate nitrogen, in plant materials, soils, etc., the Official method having been found inaccurate:

"Place the sample in an 800-cc. Kjeldahl flask; adjust to neutrality or make slightly alkaline; if water is present evaporate just to dryness on a water bath under vacuum. Add 35 to 40 cc. of salicylic acid mixture (1.0 gm. of salicylic acid to 30 cc. of concentrated nitrogen-free sulfuric acid); mix thoroughly and allow to stand for at least an hour with occasional shaking (if organic matter is present, stopper tightly with a rubber cork and allow to stand over night). Add 5 gm. of sodium thiosulfate and heat for 5 minutes with a low flame, cool, add 7 to 10 gm. of anhydrous sodium sulfate and a pinch of copper sulfate. Digest for an hour at the boiling point after the solution clears; just before the solution solidifies dilute to an estimated volume of 400 cc.; cool completely. Add a small piece of paraffin, 100 cc. of a saturated solution of sodium hydroxide, and a piece of mossy zinc; connect immediately to the distillation apparatus and distill 150 to 200 cc. over into standard acid during a period of 1 hour. Titrate the standard acid to neutrality with standard alkali and calculate the amount of nitrogen present."

The accuracy of this modified Official method has been established, the application of the method having been extended to a wide variety of samples. The Kjeldahl-Gunning-Arnold method as applied for the determination of total nonnitrate nitrogen was found inaccurate in the presence of nitrate nitrogen, appreciable amounts of which were demonstrated in certain plant materials, high results arising from reduction of a part of the nitrate being obtained, notably in the presence of sugars. Losses of ammonia and of nitric acid at various points were checked by qualitative Nessler and diphenylamine tests.

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[1] Jour. Amer. Chem. Soc., 29 (1907), No. 4, pp. 409–443.
[2] Ann. Missouri Bot. Gard., 12 (1925), No. 4, p. 367.

Loss due to exposure of rubber connections to the ammonia in distillation, together with the influence of certain effects of other manipulative details on the accuracy of the method, was demonstrated.

Determination of gelatin in ice cream, R. E. REMINGTON and L. H. McROBERTS (*Indus. and Engin. Chem., 19 (1927), No. 2, pp. 267–269*).—The Ferris method (E. S. R., 49, p. 13) was found to be improved in accuracy and convenience by the following modifications: (1) A smaller sample, (2) dilution by weight instead of by volume, (3) approximately isoelectric precipitation of casein, using hematoxylin as indicator, (4) the use of alum in addition to alcohol to secure complete precipitation of the gelatin, and (5) correction of the gelatin nitrogen for nonprecipitable milk nitrogen. The average nitrogen contents and specific rotations of 28 commercial ice cream gelatins were found to be 14.84 per cent and 117, respectively, equivalent to 17.53 per cent and 139 on the moisture- and ash-free basis. The modified method is as follows:

"Into a tared 400-cc. beaker weigh 200 gm. of the melted and thoroughly mixed sample. Add 25 cc. of water and enough hematoxylin indicator to color the sample distinctly pink. Heat to 40° C. and titrate with 10 per cent acetic acid until the pink color has completely disappeared. Return the beaker to the balance and add water until the weight of the contents reaches 250 gm. Accuracy of 0.5 gm. is sufficient. Mix thoroughly and return to the 40° water bath until the curd has fully separated. Filter through a small bag of cotton or linen.

"Weigh out 100 gm. of the filtrate, add 3 cc. of a saturated solution of potassium alum, then 200 cc. of 95 per cent alcohol, with stirring. Cooling hastens the separation of the precipitate. Filter by suction on a 9-cm. filter, using a Büchner funnel. Tear up the paper and place in water in a small beaker. Soak until the gelatin has an opportunity to swell. Then place the beaker in warm water for half an hour, first adding water to approximately 50 cc. Bring rapidly to incipient boiling and filter at once into a 100-cc. volumetric flask, washing with hot water until the flask is nearly full. Allow the flask to cool to near room temperature, make to the mark, and mix.

"The polarization can be made at once, using a jacketed tube. Circulate water, which has been heated, through the jacket until a thermometer placed in the tubulature reads 40°. Then shut off the water, allow the tube to cool to 35°, and read. If the flasks are not read at once they should be heated in a water bath at 35 to 40° for half an hour or more before placing in the polariscope tube. The weight of the serum to be used as a basis in calculating is obtained by subtracting the weight of fat and casein in 200 gm. of the sample from 250 gm. Using a 200-mm. tube for polarizing, the percentage of gelatin is given by $0.00074 \times R \times W$. Determine nitrogen in 25 cc. of the solution, deducting 2 mg. for the blank, and expressing the result in milligrams of nitrogen in the 25 cc. The percentage of gelatin is then found by $0.135 \times N \times W$."

Factors influencing char filtration, E. W. RICE and G. W. MURRAY, JR. (*Indus. and Engin. Chem., 19 (1927), No. 2, pp. 214, 215*).—There appears to be exchange adsorption between the solute and the char and also among several substances adsorbed at one time. Successive portions of materials filtered through a char may vary widely in analysis from this cause, especially when a refiner's char containing many chemical substances is used. The complete purification of raw sugar by the use of bone char alone is practically impossible.

METEOROLOGY

The problem of technical control of weather, A. WENDLER (*Das Problem*

figs. 7).—This is a review, with numerous references to the literature of the subject, of past attempts to control the weather by artificial means. The various means which have been employed to control the weather or modify its effects, including lightning, frost, and hail protection, and rain making, as well as the influence of forests, seas, marshes, rivers, mountains, and large towns, are discussed. The physical and chemical bases and principles underlying weather changes and the theories and hypotheses which have been advanced on the subject, including the polar front theory, forms of precipitation, and relation of catalysis and colloid chemistry to meteorology, are explained, and the technique of meteorological free-air experiments is described.

A study of the possibility of economic values in statistical investigations of rainfall periodicities, D. ALTER (*Bul. Amer. Met. Soc., 8 (1927), No. 3, pp. 45, 46*).—Examination of rainfall data of the British Isles to determine their probable prediction value is stated to have led to indecisive results. The author considers it probable that "in the long run predicted results will be better than chance, but whether enough better for economic use is uncertain. Test predictions of 6 months means are given for the British Isles for the next 10 years."

The dependence of yield of crops in Prussia on precipitation and temperature [trans. title], E. LESS (*Met. Ztschr. [Brunswick], 44 (1927), No. 2, pp. 61–65*).—This is a summary of a detailed report on the subject previously noted (E. S. R., 56, p. 413).

The Nile flood and world weather, E. W. BLISS (*Mem. Roy. Met. Soc., 1 [1927], No. 5, pp. 79–85, fig. 1; abs. in Sci. Abs., Sect. A—Phys., 30 (1927), No. 350, pp. 88, 89*).—A study of the Nile flood from 1869 to 1925, as measured by the annual departures from the mean of the Aswan discharges from July to October, indicates that "the Nile behaves as a member of the first group of the southern oscillation, and is inversely related to equatorial temperatures and to the North Atlantic circulation in the following winter." The correlation appears to be higher with subsequent than with preceding weather. A formula for predicting the Nile flood on June 1, based on Dutch Harbor temperature and Port Darwin pressure in the preceding quarter and Samoa temperature two quarters previously, was found to give a joint correlation of +0.72.

The yearly course of temperature and periods of plant growth [trans. title], E. RUBINSTEIN (*Met. Ztschr. [Brunswick], 44 (1927), No. 1, pp. 13–18*).—The methods and results of the author's study of the relation of temperature to the progress of plant growth are compared with those of Köppen as presented in a paper previously noted (E. S. R., 55, p. 807).

[Solar radiation], F. BOEUF and L. GORCZYŃSKI (*Ann. Serv. Bot. [Tunis], 3, (1925), No. 1, pp. 5–73, pl. 1, figs. 5*).—The utility of the study of solar radiation from the viewpoint of plant growth is discussed by Boeuf, and pyrheliometric measurements of the intensity of solar radiation made in the spring of 1924 in North Africa, particularly in the Sahara Oasis of Touggourt, are reported by Gorczyński and discussed with reference to causes and extent of variation in intensity. The apparatus used is described, and the methods employed in deducing the solar constant is explained.

Climatological data for the tropical islands of the Pacific Ocean (Oceania), W. W. REED (*U. S. Mo. Weather Rev. Sup. 28 (1927), pp. III+22, figs. 8*).—This supplement presents data regarding temperature, precipitation, relative humidity, cloudiness, winds, and tropical storms, compiled in large part from publications which are listed.

SOILS—FERTILIZERS

Colloidal behavior of soils and soil fertility.—III, Cation replacement and saturation of soil with Ca, J. S. Joffe and H. C. McLean (*Soil Sci., 23 (1927), No. 2, pp. 127–135*).—In continuation of this series of experiments, conducted at the New Jersey Experiment Stations (E. S. R., 55, p. 811), several soils of the Chenango series were treated with normal ammonium chloride solution, and the ammonia absorbed and exchangeable with potassium on treatment with normal potassium chloride was determined. The Veitch method and the method of replacement of H-ions by a normal barium chloride were compared in the determination of the lime requirement of a number of soil samples. The extent of the replacement of H-ions after 1 hour, 1 day, and 10 days in soils from the fertility plats at the stations, and H-ions replaced in 1 hour, 1 day, and 10 days, together with the H-ion replacement by normal potassium chloride in 1 day and 9 days in Chenango soils are reported. The relations of the cations of the inorganic and organic soil complex capable of base exchange, and the functions from the standpoint of base exchange of calcium ions in the soil-plant system are discussed. Methods for determining base exchange capacity and degree of unsaturation are given. The relation between unsaturation and lime requirement is analyzed, the experimental results being compared with methods for determining the lime requirement.

The liming indicated by the replacement method is deemed sufficient for best results. The degree of saturation and unsaturation in the soil profile layers suggests subsoiling for the preservation of bases leached from the surface soils.

A study of the mechanism of ionic exchange in a clay-lime complex [trans. title], A. Demolon and G. Barbier (*Compt. Rend. Acad. Sci. [Paris], 184 (1927), No. 9, pp. 537–539*).—In experiments on the base exchange capacity of the clay-lime complex, it was found that the equilibrium concentrations of calcium oxide in the solution (x) and in the clay (y), when various weights of the clay (0.25 to 5.0 gm.) were treated with the same volume (200 cc.) of solutions of potassium chloride, sodium chloride, and ammonium chloride, having concentrations equivalent to 2 per cent of potassium chloride, varied in close accordance with definite equations, different for each salt, as follows: For sodium chloride, $y=3.09\times x^{0.60}$; for potassium chloride, $y=1.70\times x^{0.43}$; and for ammonium chloride $y=1.26\times x^{0.44}$. Similar experiments with N/16 carbon dioxide are reported. It is concluded that, due to the clay colloids and to the establishment of equilibria, decalcification tends to diminish in rate in proportion to its progress.

In determining exchangeable calcium, hydrochloric acid (2 per cent by volume) was found to give practically the same results in one extraction as did ammonium chloride in several extractions provided the ratio of clay to extractant solution was not greater than 1:100.

Researches on the breakdown of cellulose in the soil [trans. title], S. Winogradsky (*Compt. Rend. Acad. Sci. [Paris], 184 (1927), No. 9, pp. 493–497*).—The technique of Hutchinson and Clayton (E. S. R., 41, p. 632), was applied in the isolation from the soil of 10 fibrolytic bacterial forms, which are provisionally classed in two groups. The first, or cytophaga, group (*Spirochaeta cytophaga* H. & C.), consists of straight or curved, but rarely spiral, forms which have a powerful fibrolytic action, transforming filter paper into a transparent glair, the color of which, as well as the form of the cells, characterizes the organisms. Various strains producing rose-colored, orange, and egg-yolk yellow glairs were isolated in pure culture. In the second group 5 cultures of small vibrio forms, some of them slightly spiral, were isolated.

They had a much less marked fibrolytic property than the cytophaga group, but spread over filter paper with remarkable rapidity, producing a pale yellow coloration. The yellowed filter paper was not disintegrated when the cultures were incubated for a month. Other vibrio forms producing abundant glair, with a yellow-brown coloration of the paper and disintegration of the fibers, were isolated, one of them reducing the whole paper to a brown gelatinous mass. Autolysis is characteristic of both groups, though especially of the first; shortly after the swelled fibers lose their structure the microorganisms, also swollen, dissolve in the glair without leaving visible spores or other resting stages.

The organisms studied differ from cellulose-destroying anaerobes in that they produce neither gas nor volatile fatty acids. The silica gel is rendered alkaline, and there is a vigorous nitrate absorption. The products formed by these organisms resembled soil humus in being colloidal and nitrogenous, resistant to further bacterial attack, and soluble in dilute alkalies.

The ionimetric determination of acidity by the inversion of sucrose.—Application to complex mixtures: Soils [trans. title], V. VINCENT (*Compt. Rend. Acad. Sci. [Paris], 184 (1927), No. 6, pp. 338–340*).—The inversion of sucrose solutions by soils is not a measure of the actual ionization of the complex mixture of acids, but it indicates the magnitude of the immediate ionization of the reserve acids on heating and furnishes a means of estimating the neutralizing value of natural liming materials.

Contribution to the study of soil protozoa [trans. title], M. KOFFMAN (*Acta Zool., 7 (1926), No. 2–3, pp. 277–328, figs. 93*).—A detailed investigation of the protozoa of garden soils about Stockholm is reported, the 93 forms identified and drawn including both forms peculiar to the soil and aquatic forms which appear in soils only under certain conditions.

The protozoa were found very sensitive to slight changes in such physiological conditions as pH. temperature, salt concentration, nutrients, etc., in the culture media. Protozoa peculiar to soils, commonly small flagellates, together with their cysts, were present in normal soils, but most of the cysts found originated from forms not peculiar to soils alone. Results obtained by soil inoculations of culture media hardly give a true picture of the actual protozean soil fauna, on account of the presence of cysts of protozoa not specifically soil forms and because of the above-noted sensitiveness of the protista. This applies equally to the identification and to the counting of the protozoa. The effect of the distribution of the protozoa on soil fertility can hardly be determined without knowing the kind and numbers of the forms present. A method applicable to the direct identification and counting of the soil protozoa, at least in certain soils, is given.

Marion County soils, R. S. SMITH, E. A. NORTON, E. E. DETURK, F. C. BAUER, and L. H. SMITH (*Illinois Sta. Soil Rpt. 34 (1926), pp. (2)+66, figs. 6, maps 2*).—This survey deals with the soils of an area of 361,894 acres in south-central Illinois. The county has a maximum range in elevation of 150 ft., and lies between two well-defined drainage basins of the Little Wabash and Kaskaskia Rivers. Notes on the geological history and soil development of the area are included, together with an explanatory appendix and soil fertility data from several experiment fields, the crop yields from these fields for some years being tabulated.

The soils are classified in 5 groups of 11 types, among which upland prairie gray silt loam on tight clay and upland timber yellow gray silt loam occupy 44.55 and 35.82 per cent of the total area, respectively. Data on the plant nutrients, fertility requirements, and crop adaptabilities of the various soil types are also given.

Soil survey of Clay County, Indiana, G. B. Jones et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+1379–1422, figs. 2, map 1*).—This report, prepared in cooperation with the Indiana Experiment Station, is in two parts:

I. [*Soil survey*], G. B. Jones et al. (pp. 1379–1409).—Clay County comprises an area of 231,040 acres of upland and alluvial plain, in part smooth plain and in part moderately rolling to hilly country, situated in the southwest quarter of the State and lying at an average elevation of 625 ft., the maximum local relief being 160 ft. The soils are mapped and described in 10 series of 18 types, in addition to mine dumps, consisting of coal mine waste, which occupy 0.5 per cent. The Vigo and Gibson silt loams occupy 34.3 and 33.1 per cent, respectively, of the area examined. Much of the bottom lands and parts of the upland plain are inadequately drained, but the Gibson, Parke, and Princeton soils have good surface and internal drainage.

II. *The management of Clay County soils*, A. T. Wiancko and S. D. Conner (pp. 1411–1422).—Analyses of these soils are reported, and suggestions for their management are given in some detail.

Soil survey of Berrien County, Michigan, J. A. Kerr et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+1343–1378, figs. 2, map 1*).—Berrien County comprises an area of 364,160 acres in the extreme southwestern corner of the State and has five natural topographical divisions: (1) A broken belt of sand dunes on the lake front, ¼ to 1 or more miles in width; (2) a belt of undulating to level land, in part poorly drained, 4 to 8 miles wide; (3) a 6- to 9-mile belt of higher and gently rolling to hilly land; (4) high outwash plains; and (5) the St. Joseph and Pawpaw River terraces. The average elevation of the county is about 800 ft.

In a survey made in cooperation with the Michigan Experiment Station, the soils of this county were mapped as 29 types and 16 series, Nappanee silt loam and Plainfield sand occupying 11.7 and 11.0 per cent of the area, respectively, while 5.9 per cent is occupied by muck, unclassified.

Soil survey of Kearney County, Nebraska, M. H. Layton et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1923, pp. III+441–484, fig. 1, map 1*).—In this report, prepared in cooperation with the University of Nebraska, the soils of an area of 330,240 acres, flat to gently rolling, situated at an average elevation of about 2,150 ft., in south-central Nebraska, are mapped as 18 types of 10 series, including dunesand 6.3 per cent, unclassified. The Holdrege and Grundy silt loams are the most prominent types, occupying 35.5 and 15.5 per cent, respectively, of the total area. The county has an average annual precipitation of 29.04 in., about 42 per cent falling in the growing season; and it is well drained, except in the flatter uplands and locally in the bottom lands, by tributaries of the Platte, Republican, and Little Blue Rivers.

[Soil fertility experiments at the Colorado Station] (*Colorado Sta. Rpt. 1926, pp. 10, 15–17, 26, 27*).—Experiments in continuation of the studies on excessive nitrate production (E. S. R., 55, p. 219) indicate that the application of an organic manure rich in carbon but low in nitrogen, such as straw, may be a possible remedy. In an attempt to control excessive nitrate production by means of acidity developed from green manure and crop residues plowed into the soil, pH determinations upon moist soils showed only a slight and economically unimportant development of acidity following the plowing under of green barley.

Studies of the part played by carbon dioxide in crop rotation showed clean fallow soils to be giving off carbon dioxide continuously, but the quantity

given off when the soil is occupied by a crop is from 3 to 10 times as great as that from fallow soil.

[Soil and fertilizer studies at the Florida Station], W. E. STOKES, R. W. RUPRECHT, and G. E. TEDDER (*Florida Sta. Rpt. 1926, pp. 14–17, 31, 32, 114, 115*).—The results of three series of greenhouse experiments with *Crotalaria striata* as a green manure indicate a distinct correlation between the composition of the plant, as affected by the stage of its growth, and its decomposition in the soil.

Tung oil press cake (about 3.5 per cent ammonia), urea, and leunasaltpeter, applied with acid phosphate and potassium sulfate at proportionate rates equivalent to 1,000 lbs. per acre of a 5–7–5 fertilizer, gave good results with beans.

In water-table experiments at the Everglades Substation, plants were found to become yellow almost as soon as up with the water at 6- and 12-in. levels. The cylinders in which the water stood at 24- to 36-in. levels produced much better plants.

[Soil studies at the Kansas Station] (*Kansas Sta. Bien. Rpt. 1925–26, pp. 29–35*).—Among the studies reported are the following:

The residual effect of alfalfa on the soil.—Plats allowed to remain in alfalfa for varying numbers of years have been planted to wheat and comparison made with plats planted with wheat continuously. The plats which had been in alfalfa contained more nitrate nitrogen at wheat seeding time than plats planted to wheat continuously. Data are presented showing the yield and nitrogen content of wheat to be greater following a year in alfalfa than when wheat was grown two years continuously. Wheat following two years in alfalfa also showed greater increases in yield than three years continuous wheat, and the increase in protein content (4.3 per cent) was more marked than in the first experiment above noted.

Plant nutrition investigations.—The relation of the molecular proportion of calcium nitrate to potassium dihydrogen phosphate was studied in greenhouse salt nutrition experiments with wheat grown to maturity. A high molecular proportion of the nitrate to the phosphate gave the best wheat growth. Greenhouse experiments on some of the Agronomy Farm soil types showed nitrogen fertilizers to give the largest increases of any of the single treatments, all of the soils responding to nitrogen, but the greatest yields were obtained by combining nitrogen with acid phosphate. Nitrogen was better absorbed from sodium nitrate than from calcium nitrate. Calcium phosphate secured better response than sodium phosphate. Alfalfa and sweet clover in an acid soil gave maximum yields when acid phosphate was used in addition to lime at the proportionate rate of 4,000 lbs. of lime to 300 lbs. of acid phosphate per acre.

A study of the soil solution as governed by the H-ion concentration.—The soil adsorption of the basic ions calcium, iron, aluminum, magnesium, potassium, sodium, etc., as affected by such anions as chlorine, sulfate, phosphate, acetate, etc., has been studied, the preliminary work having consisted of the development of methods for rapid leaching without contamination of the leachings with colloids, and for the determination of minute quantities of leached bases. Small concentrations of the sulfate ion favored the release and leaching of iron and aluminum.

[Soil studies at the Iowa Station] (*Iowa Sta. Rpt. 1926, pp. 14–18, 56, 57*).—Data showing the profit or loss from fertilizer treatment of 15 Iowa soil types in 42 experiment fields planted to corn, oats, and clover are presented in tabular form. Manure benefited all the soils, the greatest gain being on Marion silt loam and the least on Webster silty clay loam.

The application of 150 lbs. per acre of different fertilizers to corn gave the best results when mixed with soil in the hill. With quantities larger than

150 lbs. per acre broadcasting gave as good results as mixing in the hill. Tables present profit or loss from treatment of corn, oats, and clover with manure alone, with manure combined with lime and rock and acid phosphates, and with complete commercial fertilizers.

In nitrogen utilization experiments with corn, most of the nitrogen added as ammonium sulfate in an application of a 2–12–2 fertilizer had been taken up at the end of eight weeks. The difference in nitrogen content between the fertilized and unfertilized plants was several times the quantity of nitrogen applied, indicating that longer root systems developed by the fertilized plants secured more nitrogen from the surrounding soil.

Corn was found to utilize about 75 per cent of the phosphorus applied in acid phosphate and in a 2–12–2 fertilizer. The utilization of added phosphoric acid varied with the composition of the soil, being greater when the supply of natural soil phosphoric acid was low.

Field experiments on soils and crops, G. Roberts, E. J. Kinney, and J. F. Freeman (*Kentucky Sta. Bul. 272 (1926), pp. 281–351*).—The progress (E. S. R., 44, p. 510) of a large number of soil and crop experiments at Lexington and in variously located experiment fields is reported for the period 1920–1925. Among experiments which have already yielded definite conclusions were those with 200-lb. applications per acre of sodium nitrate on Burley tobacco in rotation with wheat, clover, and orchard grass, the nitrate giving increases equal to those from 20 tons of manure; 43 tests of 100 lbs. of sodium nitrate per acre on wheat following tobacco in three fields and during periods of from 4 to 11 years, showing the nitrate to give little increase when the rotation included clover; and hemp experiments, showing good yields and profitable increases from 300-lb. treatments of sodium nitrate on lands not in the highly fertile condition usually deemed essential.

AGRICULTURAL BOTANY

Methods of descriptive systematic botany, A. S. Hitchcock (*New York: John Wiley & Sons; London: Chapman & Hall, 1925, pp. VII+216*).—The author here presents the results of experience during 25 or more years in the art and science of taxonomic work. The first six chapters deal with the elements of descriptive taxonomy. The remainder of the work deals with the subject from the standpoint of advanced students or those beginning their professional careers as assistants in botanical institutions.

Monocotyledons: A morphological study, A. Arber (*Cambridge, Eng.: Univ. Press, 1925, pp. XIV+258, pl. 1, figs. 160*).—This work, one of the Cambridge Botanical Handbooks edited by A. C. Seward, though undertaken at the behest of E. Sargant and dedicated to her memory, admittedly departs fundamentally from the views which she held and advocated.

The 10 chapters deal, respectively, with the principles of morphology, the root, the axis, the foliage leaf descriptively, the leaf interpretatively, the prophyll, the seedling and its significance, the reproductive phase, taxonomy and its interpretation, and parallelism in evolution. Both bibliography and index are extensive and analytical.

The relations between distribution, structure, and transpiration of arid South Australian plants, J. G. Wood (*Roy. Soc. So. Aust. Trans. and Proc., 48 (1924), pp. 226–235, pl. 1, figs. 6*).—The transpiration studies here presented in descriptive and tabular detail are believed to give, when taken in conjunction with the soil-water relations of the plant, a valuable insight into the determination of the distribution and of the habitats of desert plants, and to show

(as regards Australian habitats) the reasons for the dominance of individual species in particular localities.

Drought resistance of crop plants (*Kansas Sta. Bien. Rpt. 1925–26, pp. 36–38*).—According to this summary, Bordeaux mixture appeared to have no significant effect on the rate of transpiration of potato plants, but the rate of transpiration of sprayed tomato plants was approximately 6 per cent higher than that of the unsprayed plants. The temperature of potato leaves sprayed with Bordeaux mixture was consistently from 0.1 to 0.2° C. higher than that of the unsprayed leaves. The difference in tomato leaves could not be detected by the apparatus used.

The results of comparative transpiration experiments indicated that under like conditions there is a specific difference in the transpiration rate of corn, dwarf yellow milo, pumpkin, cowpea, and soy bean plants, and that this difference depends on the age of the plants as well as on other factors not determined.

The daily variation of the total nitrogen content of the leaves of corn, sorghums, soy beans, and cowpeas was determined. The preliminary results are said to indicate that there is a rise of the nitrogen content in the leaves of the legumes during the day and a fall at night, but that such a change does not take place in the leaves of corn and the sorghums.

The rate of growth of the corn plant during the growing season was obtained by determining the average dry weight of five representative plants selected at random in the field at 7-day intervals. The leaf area of the plants was determined as well as their transpiration rate. The average dry weight, leaf area, and amount of water transpired by a single plant during each 7-day period is shown, from which it appears that the leaf area and transpiration increased steadily for about 80 days, at which time the plants were in full leaf development and had reached their maximum of transpiration. Dry matter continued to increase to the end of the experiment, while transpiration fell off rather abruptly.

Microchemical and morphological studies of effect of light on plants, N. E. Pfeiffer (*Bot. Gaz., 81 (1926), No. 2, pp. 173–195, pl. 1, figs. 4*).—It is found that in plants under short exposures to light there are usually low carbohydrate and low protein reserves with less total growth and less production of differentiated tissues than in plants grown during longer intervals. In plants under longer exposures there is an increase in carbohydrate reserves without proportionately increased use in elaboration of proteins and tissue production.

Nitrates were present in considerable amounts in all tomato plants except the control and gantry crane house specimens. The maximum development of the plant, considering height and differentiated tissue, occurred in the 12-hour tomato and the 17-hour buckwheat. Injury was evident in tomato exposed for 17 hours or more, resulting in marked decrease in photosynthetic ability. Continuous light tended to produce thinner leaves, with the palisade layer shorter or lacking. Thinner leaves usually showed an increase in the number of stomata except under light of continuous intensity. Root development in fibrous systems appeared roughly comparable with that of the aerial parts. In the storage roots of four-o'clock, maximum development occurred in the gantry crane houses and continuous light, while maximum height of stem occurred in the 17-hour plant.

The anthocyanin pigments of plants, M. W. Onslow (*Cambridge, Eng.: Univ. Press, 1925, 2. ed., pp. VIII+314; abs. in Nature [London], 116 (1925), No. 2923, p. 672*).—"Since the appearance of the first edition the publications

of greatest value on the subject of anthocyanin pigments have been in connection with the chemistry and biochemistry of these substances. This later work has now been included, and the present state of our knowledge of the significance of the pigments in relation to plant metabolism has, as far as possible, been indicated. . . . An attempt has been made to record the majority of these publications [on genetics], but it has been impossible, within the size and scope of this book, to give detailed accounts of the researches on the inheritance of soluble pigments. Such curtailment, however, should not be serious."

Coloring of citrus fruits, L. E. Dupont (*Florida Sta. Rpt. 1926, pp. 68, 69*).—Tests of various chemicals having a tendency to increase respiration (benzene, toluene, acetic acid, ethyl acetate, etc.) showed that they act with remarkable rapidity, but the taste they impart to the fruit renders their use impossible. Unsaturated hydrocarbons are of little value in increasing ripening, with the exception of ethylene and acetylene in concentrations of 1:1,000, and these give promising results. Most aldehydes proved too caustic and injured the texture of the rind, but acrylic aldehyde at a concentration of 1 per cent acted favorably. Combining the desirable effect of both ethylene and acrylic aldehyde, it is claimed that a process has been devised whereby the time of coloring has been reduced from 4.5 to 3 days.

Release of cell division activity due to injection of tissue fluids and cell parts [trans. title], H. Reiche (*Ztschr. Bot., 16 (1924), No. 5, pp. 241–278, pl. 1*).—Both rule and exceptions, as here noted, have a common explanation in the alleged fact that wall orientation is determied by the diffusion course of the wound-stimulus materials.

Plasma swelling and growth [trans. title], H. Walter (*Ztschr. Bot., 16 (1924), No. 7, pp. 353–417, figs. 10*).—The question whether absorption or osmotic forces are operative in plasma is difficult, if not impossible, to decide. Between absorption and osmosis no important difference can be shown. The transition from the one to the other phase of the phenomenon is as gradual and imperceptible as is that from colloid solution to molecular disperse phase. Every solution, as well as every absorptive body, possesses a certain so-called suction, which gives some conception as to its condition. The relation of these facts and conditions to growth are discussed. Numerous references to the literature are furnished.

H-ion concentration and permeability in calcifugous plants [trans. title], W. Mevius (*Ztschr. Bot., 16 (1924), No. 11, pp. 641–677, fig. 1*).—It is stated as the most important outcome of this work that in Sphagnum as in *Pinus pinaster* simple neutralization effects can not cause calciphobosity. The high pH value of these limy soils prevents these plants from making their way normally. A direct relation holds between the pH value and the conditions in the protoplasm, some features of which are discussed.

Some conditions influencing the determination of catalase activity in plant tissue, J. E. Knott (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 398–407*).—It is found that above 10° C. (50° F) catalase deteriorates, and bacterial growth soon affects catalytic activity. Toluene used at 1 to 100 parts prevents bacterial growth, but affects the velocity of catalysis. The best method to follow, when it is necessary to keep over preparations of spinach and celery, is to place the bottles on ice immediately after maceration and dilution. Tomato catalase will, however, lose its activity somewhat even when on ice for 24 hours. Catalase preparations after standing at cool temperatures will show a speeding up or increase in relative activity when small portions are exposed to air before making the catalase determination.

The rôle of chloroplasts in albumin formation in green plants [trans. title], H. Ullrich (*Ztschr. Bot., 16 (1924), No. 9, pp. 513–562, figs. 5*).—Studies

are outlined as carried out on leaves of Phaseolus, Lactuca, Tropaeolum, Brassica, Cucurbita, and Zea, mostly detached from plants grown without nitrogen supply. Such leaves, when afterwards furnished in light with nitrogen as NO_3, showed throughout the formation of nitrogenous materials, which tests proved to have been accumulated in the chloroplasts and presumably formed there. Nitrogen starvation shows diminution in size of the chloroplasts.

Growth of seedling in relation to composition of seed, M. E. REID (*Bot. Gaz., 81 (1926), No. 2, pp. 196–203, pls. 3*).—Both in darkness and in light, a high-protein, high-oil food supply appears to be the most efficient in producing growth. The results, though free from contradictions, are not regarded as conclusive and are to be repeated and elaborated.

The relation of temperature to pollen tube growth in vitro, H. E. KNOWLTON and H. P. SEVY (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 110–115, figs. 3*).—Methods and data are given. It is believed that pollen germination and initial tube elongation on an artificial medium are normal.

It is suggested that since temperature affects in a similar way the growth rate of pollen of the varieties studied, it would probably affect them similarly in the orchard whether they were growing in selfed or in crossed pistils. As pollen tubes are not injured by temperatures above freezing (35 to 40° F.) for limited periods (48 hours), it would seem that the only effect of short spells of cool weather at bloom would be that pollen-tube growth is slower with a consequent delay in fertilization. When temperatures are constantly below 50° at pollination time, the set of fruit may be considerably decreased because of slow pollen-tube growth, the embryo aborting before the pollen tube reaches it. Abnormally high temperatures at bloom (75 to 85°) may reduce the set by its permanently injurious effect on pollen tubes and pollen-tube growth.

On the determination of the percentage of abortive pollen in plants, N. FERGUSON (*Brit. Jour. Expt. Biol., 2 (1924), No. 1, pp. 65–73, fig. 1*).—The percentage of the abortive grains in pollen of *Lathraea clandestina, Ranunculus bulbosus,* and *Rubus* sp. appears to be a positive function of the age of the flowers used.

Anomalies in maize and its relatives, II, III, P. WEATHERWAX (*Bul. Torrey Bot. Club, 52 (1925), Nos. 3, pp. 87–92, figs. 4; 4, pp. 167–170, figs. 10*).—In the second member of this series (E. S. R., 47, p. 326), entitled Many-flowered Spikelets in Maize, the author notes a variation, recently observed, which appears to involve a structural change of a more fundamental nature than the variability observable in maize, in that the rachilla of the spikelet is often more complex, the number of flowers in a spikelet is more than two, and the order of the flowers is reversed. The occurrences are described, with discussion as to their history and significance.

In part 3, entitled Carpellody in Maize, two strains of corn are dealt with which have a type of defective grain, the morphology of which has, supposedly, not been described previously. The anomaly, giving a very slender grain of the shoe-peg type, originated independently in two inbred lines of ordinary field corn. It is inherited as a recessive plant character. The two generations grown from these seeds show evidences that the peculiarity is due to the metamorphosis of rudimentary stamens of the female flower into imperfectly formed pistils.

Experiments with various plants to produce change of sex in the individual, J. H. SCHAFFNER (*Bul. Torrey Bot. Club, 52 (1925), No. 2, pp. 35–47*).—Citing particular results of work done with *Thalictrum dioicum, Cannabis sativa, Morus alba, Arisaema triphyllum,* and *A. dracontium,* the author claims that "all of these experiments add decidedly to the weight of the accumulating evidence that sexuality is primarily a physiological condition, that it is prima-

rily not at all Mendelian in nature and not amenable to Mendelian analysis, that it can frequently be controlled and reversed at will even with our present crude methods, and that it is preeminently a subject for ecological and physiological experimentation.

"A final conclusion is that the time has arrived for an honest revision of the ordinary textbooks and treatises dealing with heredity and sex to conform them to the evidence established, and to discontinue the presentation of untenable hypotheses which in the first place had little more evidence in fact as a basis for their promulgation than the fertile imagination of their proponents."

Sterile culture of higher plants, G. KLEIN and J. KISSER (*Die Sterile Kultur der Höheren Pflanzen. Jena: Gustav Fischer, 1924, pp. 64, figs. 20*).—A critical and systematic treatment of sterile culture as applied to higher plants concludes with a bibliography of 114 titles.

GENETICS

A list of chromosome numbers in angiosperms, L. O. GAISER (*Genetica [The Hague], 8 (1926), No. 5, pp. 401–484*).—The list in this contribution from McMaster University chiefly includes data published between 1921 and 1925, inclusive. The bibliography embraces about 330 titles.

The chromosomes of the chick soma, R. T. HANCE (*Biol. Bul. Mar. Biol. Lab., Woods Hole, 51 (1926), No. 6, pp. 443–448, pl. 1*).—Considerable difficulties are involved in the determination of the number of chromosomes in the chick, due to the small size of the shortest chromosomes and the failure of the component granules to unite or clearly indicate their proper relations until the late metaphase stage, if at all. The average of 78 counts of the somatic cells in studies at the University of Pennsylvania was 33, but 35 or 36 is suggested as more probable. The larger chromosomes are all in the form of J's, while the shorter ones are rod shaped. The sex chromosomes are the largest pair in the male (homozygous) and the largest single one in the female. The similarity between the morphology and the behavior of the chromosomes in somatic and germinal tissue, in conjunction with the complete inability of the highly specialized somatic cells to regenerate other than like tissue leads to the somewhat tentative hypothesis that the somatic chromosomes, as far as their genetic function is concerned, have either become functionless or their cytoplasmic environment is incapable of reacting to their potentialities.

An effect of temperature and age on crossing-over in the first chromosome of *Drosophila melanogaster*, C. STERN (*Natl. Acad. Sci. Proc., 12 (1926), No. 8, pp. 530–532, fig. 1*).—Data are presented from experiments conducted at Columbia University, in which the amount of crossing over was increased within the bar to bobbed region of the sex chromosome among the flies developing from eggs laid during the first seven to nine days of adult life, by raising the females at 30° C. (86° F.), as compared with controls raised at 25°. Eggs laid at more advanced ages showed a considerable decrease in the amount of crossing over. As ova require about seven days to develop from the oocyte stage to maturity, it is assumed that the effect of the temperature is in some way associated with the localization of the spindle fiber attachment.

Correlations in orchard grass (*Dactylis glomerata*) [trans. title], Z. MAZURKIEWICZ (*Rocz. Nauk Rolnicz. i Leśnych, 13 (1925), No. 3, pp. 538–563; Ger. abs., p. 563*).—Among the correlations determined on orchard grass plants in the third vegetative year were those between total weight and number of culms $r=+0.524\pm0.039$, total weight and weight of culms $+0.899\pm0.011$, total weight and absolute leaf weight $+0.885\pm0.012$, and between absolute leaf weight and weight of culms $+0.647\pm0.032$.

Mendelian analysis of the pure breeds of livestock.—IV, The British Dairy Shorthorns, H. C. McPhee and S. Wright (*Jour. Heredity, 17 (1926), No. 11, pp. 396–401, fig. 1*).—Using methods similar to those described in previous studies (E. S. R., 54, p. 430), the coefficients of inbreeding and relationship inter se to the entire breed, to Favourite, and to Champion of England have been calculated for 100 cows selected at random from volume 6 of the Register of the British Dairy Shorthorn Association, and compared with the coefficients for the 100 highest producing cows selected from the same volume. The average milk production of the two groups, corrected for age, was 11,701 and 7,113 lbs., but no significant differences were observed between the two groups in the degree of inbreeding or relationship or when compared with the Shorthorn breed as a whole. Dairy Shorthorns have thus developed by the selection of high milk-producing animals more or less at random from the entire Shorthorn breed rather than by inbreeding from a small number.

[Genetic studies with poultry at the Connecticut Storrs Station] (*Connecticut Storrs Sta. Bul. 142 (1926), pp. 177–179*).—The studies of inbreeding and the production of abnormal embryos have been continued (E. S. R., 55, p. 26).

Inbreeding.—The first generation crosses between inbred lines showed a distinct improvement in hatchability, growth of chicks, weight of adult birds, winter egg production, and especially in the rate of attaining maturity. One such crossbred family was inbred by brother and sister matings for one generation without showing decline in vigor.

Hatchability of eggs.—Studies of abnormal embryos of the "parrot" type, which resembles chondrodistrophe in mammals, indicate that this condition arises early in development and that its chief characteristics are disturbances in the cartilage originating in the first week of development, and premature bone formation in the central part of the leg bones, in the base of the skull, and other parts, resulting in thickened and bent legs and short, misshapen heads. The ductless glands do not appear to play a part. The creeper fowl, which presents a similar condition in external appearance, has been found to be due to a single dominant factor, which is lethal when homozygous.

Further studies of the inheritance of rumplessness have shown that this condition is not lethal when homozygous, one bird having been found which produced all rumpless chicks when mated with normal males. Factors evidently operate in modifying the rumpless condition.

[Inheritance studies with poultry at the Kansas Station] (*Kansas Sta. Bien. Rpt. 1925–26, pp. 105–107*).—The inheritance of breed characters and egg production have been studied.

Inheritance of standard characteristics of breeds of poultry.—Matings of Rhode Island Reds having pale or bay red eyes produced equal numbers of offspring having pale, medium, and red eyes in the different crosses, indicating that these eye colors were not inherited. Variations in the down color of Rhode Island Red chicks studied in a similar way proved to be heritable.

A study of the inheritance of the characteristics in which the Single Comb White Leghorns and the Jersey Black Giants differ.—In studies of the inheritance of color in this cross it was found that the F_1 birds were predominantly white because of the epistatic behavior, rather than the dominance, of white to black. The yellow shank color of the White Leghorn was sex linked and dominant to the slaty shank of the Black Giant. The ear lobe color appeared to be inherited in a complex manner, but the tendency in the F_1 is toward white and the location is in an autosome.

The inheritance of egg production in Single Comb White Leghorns.—The effect in this project has been mainly directed toward the establishment of a strain which breeds true for low egg production by selection and inbreeding from an exhibition flock. After four generations many evidences of low vitality are becoming apparent.

Colour inheritance in sheep.—II, The piebald pattern of the Piebald breed, J. A. F. ROBERTS (*Jour. Genetics, 17 (1926), No. 1, pp. 77–83, pls. 2*).—Further studies of the genetic composition of the piebald pattern in sheep (E. S. R., 56, p. 32) have shown that the Piebald breed differs from other breeds in that it possesses a factor for dominant black and a recessive factor for spotting which restricts the black to certain areas in the piebald animals. This is a continuation of the series previously noted (E. S. R., 53, p. 228).

Color breeding in pigeon plumage, J. METZELAAR (*Geneva, Ill.: Amer. Pigeon Keeper, 1926, pp. 55, pls. 2, figs. 6*).—A popular presentation of the knowledge of the inheritance of colors in pigeons.

Sex-linkage and other genetical phenomena in canaries, F. M. DURHAM (*Jour. Genetics, 17 (1926), No. 1, pp. 19–32, pl. 1*).—An account is presented of the results of matings between black-eyed and pink-eyed (cinnamon plumage) canaries, the latter being a sex-linked recessive. Matings were concerned particularly with the occurrence, though rare, of pink-eyed males and black-eyed females from matings between black-eyed and pink-eyed birds. The results of crosses of cinnamon birds with lizard canaries and with the species *Chrysomitris cucullata* are also reported.

Studies in animal reproduction and inheritance (*Kansas Sta. Bien. Rpt. 1925–26, pp. 113–115*).—Experiments so far conducted with guinea pigs indicate that there is no linkage between pink eye (*p*), nonextension (*e*), nonyellow (*Cr*), nonagouti (*a*), chocolate (*b*), and smooth (*r*).

An analysis of the sex ratio of 19,000 guinea pigs produced from 1914 to 1925 showed that there were 105.8 males to 100 females. Dams were found to produce a preponderance of males in their offspring when 15 months of age.

In a study of size inheritance in rats, the F_2 generation was more variable than the F_1, pointing toward Mendelian inheritance, but the larger strains have become sterile, probably due to not mating until after 200 days of age.

In Chinchilla rabbits it was found that blue eyes are recessive to brown. The blue-eye factor is also linked to *Cr*, the factor causing the absence of red in the Chinchilla coat. The light-brown eyed condition of Flemish Giants was found to be recessive to dark-brown eyes.

A study of the inheritance of eye defects in rabbits (*Kansas Sta. Bien. Rpt. 1925–26, p. 117*).—In an effort to duplicate the work of Guyer (E. S. R., 44, p. 566), fowl serum immunized against rabbit lens protein was injected intravenously into female rabbits on alternate days from the seventh to the fourteenth day of pregnancy, while the lens of other females was broken up or needled on about the ninth day of pregnancy. Of the 59 offspring from pregnant rabbits receiving the antilens protein serum and the 110 offspring from females having the lenses needled, only one possible abnormality appeared. One animal having a slight abnormality in one eye appeared among young from untreated females. The results so far may be considered as entirely negative.

The morphogenetical value of the weight of rabbits at birth, S. KOPEĆ (*Jour. Genetics, 17 (1926), No. 2, pp. 187–198, figs. 4*).—Data are presented from studies of 80 rabbits forming the F_2 generation from 2 Himalayan does sired by a Silver buck, at the Government Institute for Agricultural Research at Pulawy, Poland, showing that the birth weights of the rabbits were dis-

tinctly related to the size of litter ($r = -0.443 \pm 0.099$). There was no such relationship between the rabbits at maturity when the number raised per litter was reduced to 4, having birth weights varying from 30 to 60 gm. When separated into two groups of approximately equal numbers according to weight at birth, and into the two sexes, those heavier at birth continued to have higher average weights up to 16 months. The correlations between the weights at the different months and the birth weights varied from 0.27 to 0.72 and were nearly all greater than 3 times the probable error. It is, therefore, concluded "that though both external and genetic agencies affect the weight of newborn rabbits, only the latter have a distinct influence upon the weight of growing and adult animals." Birth weights, therefore, give an indication of mature weight sufficiently satisfactory for studies of the inheritance of weight in rabbits.

Gynandromorphs and other irregular types in Habrobracon, P. W. and A. R. WHITING (*Biol. Bul. Mar. Biol. Lab., Woods Hole, 52 (1927), No. 2, pp. 89–120, pls. 2, figs. 8*).—This contribution is a continuation of articles previously noted (E. S. R., 56, p. 223).

Influence of age of mother on appearance of an hereditary variation in Habrobracon, P. W. WHITING (*Biol. Bul. Mar. Biol. Lab., Woods Hole, 51 (1926), No. 6, pp. 371–384, pl. 1, fig 1*).—Studies of the occurrence and inheritance of an hereditary deficiency of the external genitalia associated with a deficiency of the posterior part of the digestive tract, at the University of Maine, showed that the abnormality could be increased and maintained by selection, but the character appeared to be very complex genetically. Similar results were obtained in working with a deficiency of the genitalia associated with deficient antennae. The percentage of deficient offspring was, however, found to increase with the age of the dam up to 10 or 14 days of adult life, after which there was a decrease. No significant change in the type of deficiency associated with the age of the dam was apparent. Three explanations were suggested, of which an increased amount of crossing-over associated with the dam's age of 10 to 14 days, which coincided with the time of producing the largest percentages of abnormal offspring, appeared most probable.

The menstrual cycle in the monkey: Effect of double ovariectomy and injury to large follicles, E. ALLEN (*Soc. Expt. Biol. and Med. Proc., 23 (1926), No. 6, pp. 434–436*).—Continuing studies of the oestrous cycle in the monkey (E. S. R., 56, p. 227), it was found that the removal of both ovaries on the first day of menstruation had no apparent effect on the period, but double ovariectomy or injury to the large follicles after the follicular phase of the cycle was followed in from 4 to 6 days by typical menstruation. These menses occurred from 5 to 13 days before expectation, from which it is concluded "that menstruation is probably due to an absence of follicular hormonal stimulus after it has been acting for a certain period of time." It is, however, noted that the presence of the follicular hormone in human corpora lutea has been demonstrated, and the corpus of the monkey may also continue to secrete the follicular hormone, thus postponing the onset of menstruation.

Studies of the thyroid apparatus.—XXXIII, The rôle of the thyroid apparatus in the growth of the reproductive system, F. S. HAMMETT (*Amer. Jour. Physiol., 77 (1926), No. 3, pp. 527–547, figs. 6*).—In continuing this series of studies (E. S. R., 55, p. 859), data are presented showing the rate of growth of the testis, ovary, epididymis, and uterus of normal and thyroparathyroidectomized and parathyroidectomized male and female rats up to 100 days of age. It is concluded from the correlations made that the male reaches sexual maturity at an earlier age than the female, but environmental or dietary

conditions may hasten or retard sexual maturity. The ovary was found to develop more rapidly than the uterus. The growth of the reproductive system was not related to the activity of the thyroid or parathyroid glands except as the latter were related to body growth. The reproductive system of the male was less sensitive to thyroid and parathyroid deficiency than the reproductive system of the female.

The family resemblance of female rats with respect to (1) the ages of first oestrus, and (2) the bodyweights, C. P. STONE (*Amer. Jour. Physiol., 77 (1926), No. 3, pp. 625–637, fig. 1*).—An analysis of the relation between oestrum phenomena and growth in litter mates of female rats in the University of California colony is reported. As the age of attaining first oestrum did not appear to be affected by the litter size, individuals from all sized litters were paired at random with a litter mate, using in one comparison each individual only once and in another comparison using all possible combinations within the litter for determining the correlation between litter mates for the age at which the first oestrum occurred and the weights at 30, 40, 50, 60, 70, and 80 days.

According to the various methods used, the correlation between the litter mates for the age of attaining first oestrum was approximately 0.2, from which it was concluded that there was only a slight advantage in selecting litter mates for studying factors affecting the age at first oestrum. The body weights of sisters were much more closely correlated, ranging from approximately 0.4 to nearly 0.7, being highest at 30 days. There is, therefore, a considerable advantage in selecting litter mates for comparative studies of body weight, especially at the younger ages.

The anomalous appearance of male sexual characters in female fowls, A. S. PARKES and F. W. R. BRAMBELL (*Jour. Genetics, 17 (1926), No. 1, pp. 69–76, pls. 3*).—Observations and descriptions of the reproductive organs of five female fowls which exhibited male secondary sexual characteristics are presented. The post-mortem examinations showed that one of the fowls was a functionally active female with complete male plumage. Another showed the presence of ovarian and testicular tissue, and was, therefore, a possible case of sex reversal. The other three were females with male head furnishings and female plumage, but showed no trace of testicular tissue.

FIELD CROPS

[Agronomic studies in Colorado, L. S. DURRELL**]** (*Colorado Sta. Rpt. 1926, pp. 19–21, 23, 24*).—Deferred rotation seemed preferable to continuous grazing in low foothill pasture (cattle), the latter showing overgrazing and injury to vegetation. Inclosures protected from grazing in the national forests gave evidence that natural revegetation is fairly rapid, provided a natural stand of palatable plants has not become too thin. Intensive studies were made on mixtures of tame grasses variously clipped.

Heating alfalfa seed at 60° C (140° F.) for 1 hour was found to correct the condition known as hardness (E. S. R., 53, p. 135) and to raise the germination to 95 per cent or more. The epidermal layer of the seed coats was shown to be the factor influencing permeability, and the use of certain dyes indicated that heating so changes the chemical composition of the cells of this layer that they can absorb water. No loss of viability followed heating, as with scarification.

In tests of the field value of frosted seeds of oats and barley, often produced in the high altitudes, it was found that by using low temperatures such seeds will germinate nearly as well as normal seeds do by the usual methods. Field plantings in different parts of the State showed that frosted barley giving 95

per cent germination by the low temperature method produces about 90 per cent as good a stand as normal barley germinating 95 per cent, while frosted oats produces about 70 per cent as good a stand as normal oats.

Arsenical sprays were effective over a wide range of concentration on annual weeds and were injurious at all growth stages. However, penetration in quantities lethal to the subterranean organs was not evident with the poisons studied. The herbicidal value of Cyanogas, cyanamide, and carbon disulfide was also tested. Horizontal roots of poverty weeds grew from 4 to 10 ft. a year in natural conditions in soft soil. Morning glory roots did not spread much more but often grew deeper, and their food storage capacity seemed greater. The poverty weed roots live through three growing seasons. The size and gross morphology of roots of these weeds seem to depend on the physical characteristics of the soil. When root sections were planted at depths of from 15 cm. down to 90 cm. and single pieces below 90 cm. the morning glory showed no difference in regenerative activity due to depth as did the poverty weed. In all cases the regenerative capacity was a function of the size of the root. A definite relation was found between the rate of regeneration and season, those taken in the fall showing the highest rate. Roots of these weeds could withstand great desiccation in the soil.

Annual weeds, except those that came up from seed, were completely controlled by cutting even with the ground, and poverty weeds were materially injured. Annuals were killed by covering with soil 6 to 18 in. deep, whereas perennials penetrated the 18-in. layer. Morning glories, dug down to 6, 12, and 18 in. and all roots removed, came through 6 in. of soil but not from greater depths.

[Agronomic work at the Connecticut Storrs Station] (*Connecticut Storrs Sta. Bul. 142 (1926), pp. 174–176, figs. 2*).—Silage corn planted early generally excelled late plantings. Canadian-grown oats of a pure line were no better than home-grown seed of that line. Disease seemed a more important factor than climate in degeneracy in potatoes. Sources of seed of Green Mountain and Irish Cobbler potatoes in tests from 1921 to 1925, inclusive, ranked, respectively, Maine 100, 100; New York, 105, 111; Vermont, 105, 118; and Canada, 94, 108. Hubam sweet clover continued to surpass oats as a nurse crop for alfalfa. Attempts to get a stand of sweet clover in old pastures have been unsuccessful. The climate seemed too severe for kudzu. Fertilizer tests on pastures and rotations are noted briefly.

[Field crops investigations in Florida], W. E. STOKES, R. W. RUPRECHT, A. F. CAMP, O. F. BURGER, J. H. JEFFERIES, W. B. TISDALE, and G. E. TEDDER (*Florida Sta. Rpt. 1926, pp. 13, 14, 17–22, 32, 33–40, 81, 102–104, 109–111, 116–122, figs. 3*).—Experiments with field crops (E. S. R., 55, p. 824) at the station and substations embraced variety trials with corn, oats, sorghum, cotton, potatoes, tobacco, soy beans, peanuts, velvet beans, alfalfa, *Crotalaria* spp., and miscellaneous legumes and lawn and pasture grasses; fertilizer tests with corn, peanuts, tobacco, and pastures; breeding work with cotton and peanuts; trials of silage, cover, and green manure crops; planting tests with Crotalaria and soy beans; comparisons of delinted v. untreated cottonseed; studies of the growth, behavior, and productivity of pasture grasses; and observations on the root systems of sod-forming grasses. Analyses were made to determine the mineral content of grasses and forage crops.

[Farm crops investigations in Iowa] (*Iowa Sta. Rpt. 1926, pp. 10–14, 18, 37, 43, 55, 59*).—Field crops of particular merit included Canadian variegated alfalfa, Iobred wheat, Ames Amber sorgo, and Iogold oats. When common alfalfa from North Dakota winterkilled 30 per cent and that from Kansas

50 per cent, such sorts as Grimm, Baltic, and Cossack had practically no loss, whereas seed from Argentina, Africa, Italy, and Spain winterkilled about 100 per cent. No imported clover seed, except from Canada, was found safe for Iowa conditions. Wood clover seemed limited in its soil adaptation. The best ten F_1 corn hybrids yielded about 30 per cent more dry corn than the best standard varieties. Inheritance studies with dent sweet corn hybrids have been noted (E. S. R., 56, p. 519). Iogren oats has outyielded Iowa 103, Iowar, Green Russian, and home-grown varieties.

Farmers comparing methods of interplanting corn and soy beans reported that soy beans in corn reduces the corn yield about 10 per cent and about 15 per cent when an unsatisfactory distribution of beans is had. The reduction in the corn yield was notably greater when the beans had no nodules. In inoculation of soy beans with soil the degree of inoculation increased with the quantity of soil used from 0.5 pt. to 24 pt. per bushel of seed. Soil broadcast at the rate of 500 lbs. per acre resulted in the best inoculation. The number of soy bean organisms used in inoculation seemed of significance in obtaining desirable results. The total protein in inoculated soy beans was found to bear a definite relation to the number and size of the nodules. The percentage of protein increased with the degree of inoculation and was highest in plants best inoculated. On the test soil hydrated lime did not affect the weight of tops and roots of inoculated soy beans but increased the protein percentage very markedly in both tops and roots, whereas acid phosphate increased the weight of tops and roots but had no effect on the protein content. A method developed for sterilizing legume seeds provides for treatment of the seeds with a 20 per cent concentration of hydrogen peroxide for 30 minutes.

[**Report of field crops work in Kansas, 1924–1926**] (*Kansas Sta. Bien. Rpt. 1925–26, pp. 39–51, 133–138, 141–143, 144–147*).—Agronomic experiments (E. S. R., 52, p. 433) reported on from the station and substations for the period indicated comprised variety trials with winter and spring wheat, corn, oats, barley, rye, grain sorghum, sorgo, cotton, soy beans, cowpeas, alfalfa, and turf and lawn grasses; cultural and planting tests with oats, corn, wheat, and miscellaneous forage crops; a cutting test with alfalfa; fertilizer trials with wheat and alfalfa; and improvement work with wheat varieties and hybrids, oats, barley, corn, and sorghum. The resistance of certain oats strains to smut is indicated, and the behavior of false wild types and other aberrant forms in Kanota oats is again commented on.

Such sorghums as feterita, milo, Amber sorgo, and shallu were severely injured by chinch bug, while durra, kaoliang, Sumac, kafir, and the hybrids milo×kafir, hegari×milo, and Kansas Orange×milo were distinctly resistant. Plants showing the most heterosis apparently withstood chinch bug attack most successfully. Smut resistance studies revealed that, excepting a few susceptible strains, feterita, Kansas Orange, Sumac, and hegari×milo were generally resistant, whereas Dwarf Yellow milo, kafir, and some natural milo hybrids were generally susceptible.

Interplanting tests showed the yield of corn to be reduced in proportion to the quantity of soy beans produced. During 10 years April 20 to May 1 has been the optimum planting period for corn, and planting with a furrow opener on plowed land resulted in larger yields than listing and surface planting. From 16 to 20 in. in 42-in. rows has been optimum for corn of the Pride of Saline type. The main purpose of cultivation was shown to be weed control, and stirring the ground with a one-horse cultivator after corn is laid by seemed a waste of time and effort. Of hybrids between selfed lines of corn, the highest yielding combinations were crosses between lines of locally adapted sorts.

No consistent decrease in the number of bindweeds was observed to result from any of several chemical treatments compared with hoed fallow except on plats sprayed with sodium chlorate solution. Tests at the Fort Hays Substation suggested starting work with fallow in April and May, since spring-plowed fallow encourages more rapid growth of the weed. Sorghum smother crops succeeded best when sown about July 1 after an intensive fallow period. Effective eradication appeared to have resulted from 8 tons or more of salt without mulching or watering. With these treatments the salt was less effective. Under moister soil conditions all rates below 20 tons were ineffective.

In the tillage experiments at Fort Hays increased winter wheat yields were secured by early fall listing or early plowing as compared with late plowing. A study of the relation of crop yield to climate indicated that the character and distribution of rainfall is much more important than the total quantity. The distribution of rainfall appeared to be the prime factor governing the degree of tillering, time of heading, and seed production of grain sorghums grown in variously spaced rows. In 1924 and 1925 drought preceding the heading period and followed later by excessive rainfall was more favorable for seed production in wide-spaced rows than in single-spaced rows, while in years of normally distributed rainfall the reverse held true. Total yields in single spaced rows, however, have always exceeded those in rows spaced wider

During 11 years for which data are available at Garden City winter wheat failed six times regardless of the cultural method. Wheat on fallow in rotation averaged 10.8 bu. per acre. The highest yielding continuously cropped plat, early fall listed, averaged 7.6 bu. per acre as compared to 6.1 bu. for early fall plowing and 4.8 bu. for late fall plowing. Ordinary rows have produced more milo grain than double width rows. The fertility experiments under irrigation during 5 years did not show material benefit from commercial fertilizers. The lowest and highest average yields of alfalfa were made on land receiving 24 and 64 in., respectively, of irrigation water annually, the optimum appearing to lie between 36 and 42 in. for average years. The average yields of the various feed, grain, and row crops in the irrigated rotations showed that considerable benefit resulted from the use of alfalfa in rotation with these crops.

[Field crops investigations in Kenya, 1923–24 and 1924–25], A. Holm, G. L. J. Burton, G. M. Hamilton, E. Harrison, W. L. Watt, and R. J. Lathbury (*Kenya Colony Dept. Agr. Ann. Rpts. 1924, pp. 8–13, 15–17, 112–121, 128–135; 1925, pp. 10–14, 16–18, 22–24, 149–152, 160–163, 175–177, 192–201, pls. 3*).—These pages report the continuation of experiments with various field crops noted earlier (E. S. R., 53, p. 632).

[Field crops work in Uganda in 1924 and 1925], S. Simpson, L. Hewett, et al. (*Uganda Dept. Agr. Ann. Rpts. 1924, pp. 4–6, 8, 14–17, 30, 31; 1925, pp. 4–6, 7, 8, 13, 14, 16–22, 34, 35*).—The continuation of previous investigations (E. S. R., 52, p. 34) is reported on.

The results of examinations by the Imperial Institute on silk (*Anaphe infracta*) from Uganda, describing degumming tests and yarns and fabrics made therefrom, are given in the 1924 report. Twenty-five species of native grasses being tested for their forage value are described in the 1925 report.

Varieties of general crops for muck land, P. M. Harmer, C. E. Cormany, and E. E. Down (*Michigan Sta. Quart. Bul., 9 (1927), No. 3, pp. 83–89*).—The comparative yields on fertilized and unfertilized muck lands and recommendations are given for varieties of oats, barley, corn, potatoes, and sugar beets.

Fertilization and yield on different peat soil types [trans. title], A. BAUMAN (*Svenska Mosskulturför. Tidskr., 40 (1926), No. 4, pp. 300–310*).—The yields secured in experiments conducted for a series of years in different localities with a variety of crops are reported and briefly discussed. The weight of the soil per cubic meter and the soil content of organic matter, lime, and nitrogen for the different localities are given, together with the crop rotation followed. The fertilizer applications per hectare on the larger number of plats, consisting of 200 kg. (178 lbs. per acre) of 40 per cent potash salt and 200 kg. of 20 per cent superphosphate, were compared with the use of no fertilizer and applications of 250 kg. of the potash salt and 200 kg of the superphosphate, 30 tons of barnyard manure (12.14 tons per acre), 30 tons of the manure with 300 kg. each of the potash salt and the superphosphate, and 300 kg. of the potash salt with 400 kg. of Thomas slag.

In nearly all cases the fertilizer applications produced the largest crop increases on the soils more recently brought under cultivation. Meadows treated with light applications in the beginning of the test produced larger increases in yield than those secured where the initial applications were heavy. On sphagnum moor soil meadows, largely of clover, and on land growing leguminous crops, the yields of green forage were about the same under the potash and superphosphate treatment; but when the meadows were in grass a supplementary treatment of 100 to 150 kg. per hectare of nitrate of soda or Norwegian nitrate was required to make the yields uniform.

Liming lime-poor peaty soils produced marked yield increases, and the effect of liming was perceptible for 10 years. The application of 250 to 500 cubic meters per hectare (132 to 265 cu. yds. per acre) of sand, gravel, or clay on peat or moor soils proved efficient in increasing the yields and making them more uniform.

Characteristics of the roots of meadow and pasture plants [trans. title], D. SCHRÖDER (*Landw. Jahrb., 64 (1926), No. 1, pp. 41–64, figs. 24*).—The distinctive characteristics of the roots of 24 grasses and other meadow and pasture plants are set forth in a determinative key, supplemented by illustrations of enlargements (200:1) of cross sections.

Work of the Swedish Moor Culture Association, 1886–1925 [trans. title], H. OSVALD (*Svenska Mosskulturför. Tidskr., 40 (1926), No. 4, pp. 239–287, figs. 9*).—In this publication the history of the Association is outlined, the various activities are described, and the results of the work are summarized.

Permanent pastures, M. E. MCCOLLAM (*Washington Col. Sta. Bul. 211 (1927), pp. 56, figs. 8*).—The importance of pastures in western Washington, pasture land types and current practices, the characteristics of permanent pasture grasses and clovers, seeding mixtures, and recommended cultural and management practices are described, with a report of pasture experiments at the Western Washington Station.

In 4 years' tests, a mixed sod originally in good condition and subjected to grazing, was successfully maintained by alternate grazing, close grazing, and heavy stocking. Further treatment, including manure and superphosphate top-dressing, scarifying, and reseeding, produced marked improvement in the grass yield, this being the most promising improvement method tested. Scarifying with a spike-tooth harrow successfully controlled moss, while a lime top-dressing did not. Noteworthy behavior of the flora on the various plats included the equalization of the percentage of the several grasses under the manure and superphosphate treatment as well as an increase in white clover, a heavy increase of white clover under the superphosphate with and without lime, no diminution of velvet grass under close grazing, maintenance of Italian

ryegrass on the reseeded plats and disappearance on those not reseeded, and a remarkable increase in hop clover on the untreated pasture.

Effect of growing legumes upon succeeding crops, F. LÖHNIS (*Soil Sci.*, *22 (1926), No. 5, pp. 355–389, fig. 1*).—Field, greenhouse, and laboratory experiments conducted by the Bureau of Plant Industry, U. S. D. A., dealt with the effects of legumes upon succeeding crops, involving a number of crop rotations.

The results are said to have shown conclusively that the beneficial after effect exerted by legumes harvested for hay is due to a considerable extent to favorable changes in the microflora of the soil. These changes are still marked and even increase a few weeks after the surface growth of the legumes has been removed, but several months later, and especially after the soil has dried out thoroughly, this beneficial effect upon the succeeding crop no longer seems to be noticeable. The increases in the succeeding crops caused by this after effect of harvested legumes often exceed those caused by legumes used as green manures, and the author holds it probable that in field tests the crop increases ascribed to green manuring are in fact more frequently due to the special after effect of the growing legumes.

Fallow for small grains, R. S. TOWLE (*Wyoming Sta. Bul. 150 (1927), pp. 33–42, figs. 2*).—In experiments at the Sheridan Field Station (E. S. R., 52, p. 527) in cooperation with the U. S. Department of Agriculture during the period 1918–1926, inclusive, winter wheat yielded nearly twice as much on fallow as after winter wheat, 46 per cent more than when seeded on oats stubble, and 37 per cent more than on disked corn ground. While higher yields of spring wheat and oats were made on fallow than on land cropped the year before, the gain by the fallow was smaller than with winter wheat. Fair yields were made on fallow in years when the crop after small grain or corn was poor or practically failed. Barley averaged nearly as much on corn ground as on fallow. The increase in winter wheat yield due to fallow appeared enough to pay for the fallow, except possibly where the crop may follow corn, whereas the increase with spring grain did not seem economical. Part of the small grain acreage should be grown on fallow to insure a crop in dry years and to aid in weed control.

Experiments with grain crops, R. SUMMERBY and E. A. LODS (*Quebec Dept. Agr. Bul. 90 (1925), pp. 15, figs. 3*).—The results of varietal trials with barley, oats, and wheat, and seeding trials with barley, oats, wheat, and field peas carried on at Macdonald College within the period 1906–1921 are summarized.

The after-ripening of cereals [trans. title], Z. PIETRUSZCZYŃSKI (*Rocz. Nauk Rolnicz. i Leśnych, 15 (1926), No. 1, pp. 206–235; Ger. abs., pp. 234, 235*).—Extensive experiments by the author showed that the period required by cereal grains to attain full maturity and maximum germination energy varied with the species, variety, and race. The after-ripening period is longest in oats, shorter in barley and wheat, and shortest in rye, and shorter in winter cereals than in spring grains. The period differed among different varieties grown under like conditions, being shorter in the early rather than in late maturing varieties. Seasonal conditions in different years produced a variation in the period in the same variety. In dry years the seed attained its maximum germinability early, while the period was prolonged in damp years.

Breeding improved varieties of smooth-awned barleys, H. K. HAYES (*Jour. Heredity, 17 (1926), No. 10, pp. 371–381, figs. 6*).—Methods used at the Minnesota Experiment Station in breeding desirable economic smooth-awned barleys (E. S. R., 47, p. 228) are described, with comments on several smooth-awned varieties obtained thereby.

A first series of purified hybrids between smooth-awned sorts and standard barleys failed in Minnesota because they were more susceptible to the spot

blotch disease (*Helminthosporium sativum*) than standard varieties. In a second series of crosses, wherein the problem of resistance to *H. sativum* was attacked, two or three main pairs or groups of genetic factors were involved, and there was linkage between the factors for susceptibility v. resistance with the factors for black v. white grain color and smooth v. rough awn. The linkage, however, was not absolute, and crossovers made it possible to obtain smooth-awned, white-seeded varieties, also resistant to *H. sativum*, e. g., Velvet, Comfort, and Glabron. These barleys appear to equal Manchuria in yielding ability, strength of straw, and resistance to attacks of *H. sativum*. Glabron seems more desirable as to strength of straw than Manchuria (Minnesota 184), the currently recommended variety in Minnesota, being adapted therefore for rich lands where ordinary varieties of Manchuria lodge badly.

"The McNaughton system" of curing beans, H. R. Pettigrove (*Michigan Sta. Quart. Bul., 9 (1927), No. 3, pp. 113–116, figs. 2*).—The McNaughton system, essentially consisting of stacking windrowed pulled beans on a straw pad around a steel fence post, is outlined. Experience at the station indicates that this method will eliminate most harvest hazards, facilitate curing, reduce losses, and permit earlier seeding of fall grains.

Hard seeds and broken seedlings in red clover (Trifolium pratense).—II, Storage problems, A. Nelson (*Bot. Soc. Edinb. Trans. and Proc., 29 (1925–26), pt. 3, pp. 282–290, figs. 5*).—As in a previous report (E. S. R., 52, p. 831) abrasion resulted directly in the production of broken seedlings proportional to the intensity of abrasion. Immediately on storage the percentage of broken seedlings declined, with concurrent rise in the percentage of seeds which germinate normally. Further storage resulted in a rapid loss in value of the abraded lots, due to a rapid death rate proportional to the degree of abrasion.

Broken seedlings are attributed to testa weakness caused by abrasion and their subsequent disappearance and the following death rate to continued loss of embryonic vigor, resulting in a return to a balance of internal pressure to seed coat strength. All these fluctuations are proportional to the degree of abrasion. Moist storage kills off a class of seed distinct from the abraded seed, probably those with a weak or immature embryo.

"Hard seeds" in Leguminosae, A. Nelson (*Nature [London], 118 (1926), No. 2979, pp. 804, 805*).—Working with sweet peas and other legumes, the author found good evidence for the belief that hardness does not lie in the seed coat itself but is the result of a varnish-like deposition on the seed surface produced within and by the pod. It is suggested that the watery fluid found bathing the seeds, when fully concentrated, deposits the varnish, which on drying becomes insoluble in water and forms an impermeable film. Treatment with dilute sulfuric acid, even for a short period, causes hard seeds to behave normally, whereas prolonged digestion with concentrated caustic potash has no effect. Hard seed occur in practically every sample and are considerably affected by the weather previous to harvest. "Further, the best ripened seeds always contain most hard seeds."

Moisture content of corn in relation to relative humidity and temperature of the atmosphere, H. W. Alberts (*Jour. Amer. Soc. Agron., 18 (1926), No. 11, pp. 1029–1034, fig. 1*).—The moisture content of shelled Reid Yellow Dent corn was observed at constant temperatures of about 0, 10, 20, and 30° C. at relative humidities ranging from 0 to 100 per cent at the University of Illinois.

The moisture in the corn was found to be practically independent of temperature and to vary only with relative humidity, except when the latter was extremely low or extremely high (below 10 per cent and above 90 per cent).

When the relative humidity was about 100 per cent, the moisture content of the corn was greatest at the highest temperature, and when the relative humidity approached 0 per cent the moisture content was greatest at the lowest temperature. Since a rise in temperature increases the moisture-absorbing capacity of the air, application of artificial heat, together with ventilation, is deemed advisable on cold winter days to maintain a low moisture content in corn in seed-corn storage houses.

Removal of plant food in thinning corn, J. Davidson (*Jour. Amer. Soc. Agron., 18 (1926), No. 11, pp. 962–966*).—Analysis of Boone County White corn seedlings removed during thinnings to 3 per hill at 18 days after planting and to 2 a week later showed that the seedlings pulled out took away considerable quantities of nitrogen and potassium from the hills but left behind small quantities of the phosphorus originally contained in the seed. About twice as much potassium and nitrogen was absorbed between the first and second thinnings by the corn seedlings as between planting and the first thinning. The young corn seedlings contained appreciable quantities of nitrates and ammonium salts.

Application of sodium nitrate and ammonium sulfate consistently increased the absorption of nitrogen, potassium, and phosphorus by the seedlings during the period between planting and the first thinning, but this effect became less pronounced at the time of the second thinning. Prompt thinning, avoiding overplanting, and the use of good seed may conserve the nutrients immediately available to seedlings remaining after thinning.

Results of fertilizer experiments with cotton on Alabama soils, J. T. Williamson (*Jour. Amer. Soc. Agron., 18 (1926), No. 11, pp. 1050, 1051*).—The average of numerous experiments by the Alabama Experiment Station showed that a complete fertilizer gives best results on cotton on nearly all Alabama soils. Recent tests on rate and ratio of applying fertilizer to cotton made on Norfolk, Orangeburg, Dekalb, and Decatur soils showed that the proper rates for combining materials for cotton is sodium nitrate 100 lbs., acid phosphate 200 lbs., and potassium chloride 25 lbs. Combined in the above ratio the average profit from the use of 650 lbs. per acre surpassed that from rates of 325 and 975 lbs.

A botanical study of the flax plant.—V, The effects of artificial fertilisers on the external and internal characters of the flax plant, A. G. Davin (*Linen Indus. Research Assoc., Research Inst. Mem. 27 [1925], pp. 15, fig. 1*).—Observations on the effect of superphosphate, ammonium sulfate, and potassium chloride on flax (E. S. R., 53, p. 522) grown in plats subjected to statistical analyses showed that potassium not used in excess may cause an increase in length and superphosphate an increase in the percentage of fiber. A combined dressing of 5 cwt. per acre of superphosphate and 2 cwt. of potassium chloride is indicated for tallness, high fiber percentage, and early maturity. The use of ammonium sulfate, except on soils known to be deficient in nitrogen, did not seem advantageous, as it produces thick succulent stems which are easily lodged while the quantity of fiber remains the same.

Investigations on the fruiting habits of the horse bean (Vicia faba major) [trans. title], J. Golińska (*Rocz. Nauk. Rolnicz. i Leśnych, 15 (1926), No. 3, pp. 528–553, figs. 4; Eng. abs., pp. 551–553*).—Studies on plants of Windsor and Mazagan horse beans, variously pruned to 1 and 2 pods per leaf axil, topped, or with the flowers stripped from the lower half of the stalks, demonstrated the existence of a close relation between the vegetative and reproductive stages. Removal of pods seemed to prolong the growing season, increase the leaf surface, and promote bushiness of the plant. The degree of bushiness did not appear to affect the size of the seed or the height of the plant. Quality of seed

does not depend on the place of fruit setting or on the percentage of pods gathered. The size of seed was smaller in topped plants and in plants with the lower half stripped than in normal plants. Correlations regarding 100-seed weight were generally low, whereas those between size of seed and height of plant and grain yield were relatively high. The plants with single pods on each leaf axil bore the largest pods and seeds.

Influence of spacing on the yield and individual variability of potatoes [trans. title], Z. Ruebenbauer (*Rocz. Nauk Rolnicz. i Leśnych, 15 (1926), No. 2, pp. 339–370; Ger. abs., pp. 368–370*).—The investigations reported on were concerned with effects of spacings of 30 by 30 cm., 42.5 by 42.5, and 60 by 60 cm. on the yields, number and weight of tubers, starch yields, and starch content of the Silesia and Jubel potato varieties. Several correlations are indicated.

[Descriptions of potato varieties cultivated in Poland] J. Golińska (*Rocz. Nauk Rolnicz. i Leśnych, 14 (1925), No. 1, pp. 57–111, figs. 17; Fr. abs., pp. 77, 78*).—Forty-five potato varieties cultivated in Poland are described, important flower, germ, stalk, and tuber characters being arranged in comparative tables.

Seed potato certification in Pennsylvania, W. A. McCubbin, R. E. Hartman, and K. W. Lauer (*Penn. Dept. Agr. Bul. 420 (1926), pp. 45, figs. 16*).—This bulletin briefly reviews the development and status of seed potato certification in the United States and Pennsylvania, outlines inspection and certification standards, and indicates important factors in the growing of seed potatoes. Prominent varieties are described and are classified on a flower color and tuber color basis. A detailed discussion of disease and insect control is supplemented by a key to the common potato diseases. Diseases affecting seed certification are described and illustrated, and control methods are outlined.

Sisal culture in German East Africa, R. Hindorf (*Der Sisalbau in Deutsch-Ostrafrika. Berlin: Dietrich Reimer, 1925, pp. VIII+171, figs. 33*).—This book relates the development and status of sisal production in East Africa, particularly in the former German colonies, points out growth conditions and other factors in economical production, outlines cultural and field practices, harvesting, and methods of preparing the fiber, gives an account of breeding work with sisal, and indicates the prospects of the crop.

A preliminary note on the relation of photosynthetic carbohydrate to nodule formation on soybeans, L. T. Leonard (*Jour. Amer. Soc. Agron., 18 (1926), No. 11, pp. 1012–1116*).—Preliminary experiments in the Bureau of Plant Industry, U. S. D. A., indicated that nodule formation on certain varieties of soy beans is intimately connected with a carbohydrate-forming function of the plant to such extent that nodule formation will be greatly inhibited when insufficiency of light, carbon dioxide, or chlorophyll excessively diminishes the plant's capacity to produce the proper carbohydrate.

A critical study of methods used in varietal tests with sugar beets [trans title], F. Kotowski (*Rocz. Nauk Rolnicz. i Leśnych, 13 (1925), No. 3, pp. 509–537; Eng. abs., p. 537*).—Statistical studies on 38 strains of sugar beets showed the existence of systematic errors. The variation observed emphasized the Gaussian law in about three-fourths of the strains. The use of control plats restricted the limits of variation in each strain. Reducing the replications from 16 to as low as 8 did not alter the reliability of the results.

Fitting and fertilizing soil for sugar beets, J. D. Romaine (*Michigan Sta. Quart. Bul., 9 (1927), No. 3, pp. 103–105*).—Soil preparation and fertilizer practices are outlined for sugar beets. Application of 300 to 400 lbs. of commercial fertilizer per acre has generally given the highest profits. With med-

erate quantities, 300 lbs. or less, application in the row by the fertilizer attachment on the beet seeder has given satisfactory results, whereas broadcasting has been better for heavier applications.

Production test of commercial sugar beet seed, J. G. Lill (*Michigan Sta. Quart. Bul., 9 (1927), No. 3, pp. 110–113*).—The stand, acre beet and sugar yields, sugar content and purity, and relative behavior of beets grown from each of 44 brands of commercial beet seeds in 1926 are tabulated.

Tucumán seedling canes [trans. title], **W. E. Cross** (*Rev. Indus. y Agr. Tucumán, 17 (1926), No. 1–2, pp. 5–31*).—Agronomic studies and analyses on sugar cane seedlings (E. S. R., 51, p. 640) produced in Tucumán are reported on for the crop years 1923–24 and 1924–25.

Sugarcane varieties of Bombay Presidency, India, J. B. Knight (*Bombay Dept. Agr. Bul. 122 (1925), pp. 28, figs. 5*).—Fifteen varieties of sugar cane are described and grouped in a determinative key.

Exotic sugarcane varieties in the Bombay Deccan, P. C. Patil and V. G. Patwardhan (*Bombay Dept. Agr. Bul. 125 (1925), pp. 45, pls. 7*).—Promising introduced sugar cane varieties are described, with data on yields and analyses.

The blooming of the sunflower [trans. title], **O. N. Arnol'dova (Arnoldowa)** (*Zhur. Opytn. Agron. Iugo-Vostoka (Jour. Expt. Landw. Südost. Eur.-Russlands), 3 (1926), No. 1, pp. 131–143; Eng. abs., p. 143*).—Investigations on the blooming of sunflowers under field conditions at the Saratov, U. S. S. R., Experiment Station demonstrated that sunflower pollen is capable of functioning for extended periods. With pollen preserved for from 11 to 12 months at room temperature from 18 to 24 per cent of fertilization was obtained, with pollen from 4 to 33 days old 26.2 to 80.4 per cent, and with pollen from 1 to 3 days old 72 to 97 per cent. The stigmas were observed to maintain receptivity up to about 16 days. This functionality of the pollen and stigmas is claimed to permit the hybridization of forms differing widely in their blooming periods.

Seasonal changes in the composition of winter wheat plants in relation to frost resistance, R. Newton and W. R. Brown (*Jour. Agr. Sci. [England], 16 (1926), No. 4, pp. 522–538, figs. 3*).—Further studies (E. S. R., 52, p. 835) were made at the University of Alberta of the changes occcurring during fall and winter in winter wheat plants of varieties widely different in winter hardiness.

The reduction in moisture content, which takes place to a greater degree in hardy varieties, seemed to be a most important change in the quantitative relations of the plant constituents. The resulting concentration of colloids and sugars in the cell fluids increases the resistance to freezing. Proteins were found to constitute the bulk of the cell colloids, about 90 per cent of the total protein of the plants being contained in the fluids. Pentosans are restricted almost wholly to the structural parts of the plant, although pentose sugars are present in small concentration in the fluids, and the ash occurs mainly in the fluids. Sugars accumulate in all varieties in the fall, but in general reach and maintain a higher concentration in hardy varieties. As the sugar protection of the proteins against frost denaturation increases with concentration, this apparently gives the hardy varieties an important advantage. Lipoids seem unimportant in the physiology of frost resistance in wheat. While amino nitrogen and noncoagulable nitrogen increase as the season progresses, no correlation has been found between the apparent degree of protein splitting and the relative hardiness of varieties.

A better method for winter wheat production, W. L. Quayle and A. L. Nelson (*Wyoming Sta. Bul. 151 (1927), pp. 43–54, figs. 3*).—In experiments on the Cheyenne Experiment Farm in cooperation with the U. S. Department of Agriculture winter wheat (1923–1926) seeded with the common drill averaged

8.8 bu. per acre on early plowed fallow and 13.5 bu. on late plowed fallow; that sown with the furrow drill averaged 18.4 and 18.7 bu., respectively. Winter wheat (1924–1926) on fallow cultivated with the duck foot cultivator averaged 25.9 bu., on plowed fallow 19.2, and on duck footed oats stubble 12.2 bu. The furrow drill helps avoid winterkilling, insures better germination, and leaves the land in better condition to retain rain and snow and to protect against winds, drying, and soil blowing. Use of the duck foot cultivator minimizes drying, excess run-off, and soil shifting, distributes better and saves man and horse labor, and is more effective in controlling weed growth.

Wheat-breeding investigations at the Plant Breeding Institute, Cambridge, R. H. Biffen and F. L. Engledow (*[Gt. Brit.] Min. Agr. and Fisheries, Research Monog. 4 (1926), pp. 114, pls. 24, figs. 7*).—With a view of explaining the bearing of research on practical agriculture, this monograph reviews the wheat-growing problem and discusses heredity and its complications, general breeding methods, and the means and results of breeding wheat for stiffness of straw, disease resistance, and for yield and quality of grain.

Correlations and yields in bread wheats, H. B. Sprague (*Jour. Amer. Soc. Agron., 18 (1926), No. 11, pp. 971–996*).—Intensive studies were made at the New Jersey Experiment Stations on important agronomic characters of Red Rock and Kanred wheats grown at New Brunswick, N. J., in 1924 and 1925, and also on Kanred from the 1925 crop at Lincoln and North Platte, Nebr., and on Nebraska No. 60 (Turkey) grown under various conditions at the Nebraska Experiment Station in 1921 and 1922. The crops were grown in drilled rows with normal seeding rates, and a unit of area comprising 1-ft. sections of drill row was used as a basis of comparison. Thirty-six units of area furnished the data for each variety at each station, except that 10 1-ft. units were taken from each of the several treatments accorded Nebraska No. 60. A physiological explanation of the various correlations is given, and their application to breeding and selection work is suggested.

Correlations between averages of the characters per culm or spike per unit of area gave approximately the same coefficients as those obtained by using individual culm or spike characters as the basis of comparison. Yields per acre and the means of the culm and spike characters varied widely with the climatic conditions and the variety.

The more favorable conditions for growth resulted in more tillers per unit of area or in an increase in the size of the individual tillers without greatly influencing the correlations existing between tiller characters. Correlations between the tiller characters measured, except those involving culm length or weight per kernel, were fairly stable, regardless of the variety or where it was grown. Correlations between culm length and other tiller characters, except straw yield per culm, fluctuated widely, but without definite relation to climatic data available for the crops used. Average weight per kernel was found highly correlated with straw yield per culm only when climatic conditions favored normal ripening.

[Factors influencing the quality of Kansas wheat] (*Kansas Sta. Bien. Rpt. 1925–26, pp. 51–57*).—Analyses and milling and baking tests on wheat from fertility and rotation plats (E. S. R., 52, p. 439; 56, p. 39) showed that in general applications of nitrogenous fertilizers, except in the form of barnyard manure or cowpeas plowed under for green manure, slightly increased the protein content of wheat. The most phosphorus was obtained from plats fertilized with acid phosphate. The phosphorus content of the flour bore no relation to that of the grain, since the bran which is removed in milling contains about eleven times more phosphorus than the endosperm. The ash in wheat

and the acidity of wheat and flour did not vary with the different fertilizer and rotation treatments.

Tests of the 1924 crop samples failed to show superiority for the new varieties. Poor results were had with Blackhull, Nebraska No. 28, and a Turkey selection, which all appeared to have weak gluten, while for other sorts a strong gluten was indicated. Varieties grown at Fort Hays averaged from 4 to 5 per cent more protein than those grown at the station, but this was not reflected in correspondingly better baking qualities. Comparable results on samples of Kanrad, Turkey, Blackhull, and Fulcaster revealed the protein contents to be higher in 1925 than in 1924, but not as high as in 1923. Marked varietal differences were not seen in 1924, while in 1925 Blackhull was distinctly the poorest, giving a smaller volume and poorer texture for all ranges of protein, suggesting that this variety has gluten of weaker quality than the others observed. The general averages as well as the range in protein content for 749 samples representing 20 varieties of Kansas-grown wheat were greater in 1924 than in 1925. The protein range in any one variety so exceeds the differences in protein between varieties that protein content did not seem to be a varietal characteristic.

Studies on farm-stored wheat indicated that there is little danger of heating and damage to combine wheat if fully ripened when cut and if not wet by rain. Excess moisture due to immaturity of grain appears to be a more serious and frequent cause of damage by heating than moisture from rain or dew. Unsatisfactory baking results were had when over 5 per cent of bin-burned wheat was mixed with sound wheat.

[**Weed control in Iowa**] (*Iowa Sta. Rpt. 1926, pp. 29, 30, 33*).—An investigation of the competition between weeds and bluegrass showed that bluegrass pastures lost 50 per cent of their forage value because of the presence of small ragweed, which is destructive during August and September. It is easily destroyed by iron sulfate at the rate of 100 lbs. to a barrel of water applied best during July. Sow thistle has been found in eight or ten different localities in the State. Chemical studies upon the underground portions of Canada thistle, made with a view toward eradication, demonstrated that the least quantities of stored food material occurred just before the flowers bloomed and the most in December. Roots absorbed mineral elements from the soil even when it was frozen solid.

Weeds of ponds, water-courses, and undrained lands, J. Percival and H. C. Long (*Jour. Bath and West and South. Counties Soc., 5. ser., 20 (1925–26), pp. 31–53, pls. 4, figs. 15*).—Some of the more important weeds of undrained land, ditches, ponds, and streams are briefly described, with outlines of methods of control by means of weed cutters and other devices, swans, and chemicals.

HORTICULTURE

Report of the horticulturist, E. P. Sandsten (*Colorado Sta. Rpt. 1926, pp. 33, 34, 35–37*).—Like that of the preceding year (E. S. R., 55, p. 235), this report includes brief summaries of progress. The production of first generation hybrid tomato seed as a commercial proposition failed to meet with the expected success, the increases in yield being insufficient to offset the increases in the cost of production. Plant selection gave better results. In soil studies in an orchard at Austin the growing of cover crops greatly improved the quality of the fruit. Denia and Valencia onions yielded at the rates of over 1,000 and 1,200 bu. per acre, respectively. Fertilizer studies with lettuce and tomatoes showed the superior value of animal to chemical manures.

[Horticultural investigations at the Florida Station] (*Florida Sta. Rpt. 1926, pp. 30, 31, 51–56, 59–64, figs. 5*).—Tomato fertilizer studies, conducted by R. W. Ruprecht in Dade County, in cooperation with the U. S. D. A. Bureau of Plant Industry, emphasized the value of manganese, both in promoting growth and yields. The long-continued studies (E. S. R., 55, p. 832) at Lake Alfred of various sources of phosphoric acid for citrus fruits were concluded, due to the sale of the grove. Quantitative studies with potash at Lake Alfred failed to show any obvious external or internal difference in either oranges or grapefruit that could be attributed to potash. Chemical analysis indicated that fruits on high potash plats took up more potash but had a lower sugar content than those on the low potash plats. Qualitative tests with potash at Lake Alfred and at Vero Beach failed to show any marked differences due to the form used. Pecan fertility studies carried on in cooperation with the Bureau of Plant Industry showed that fertilizers, especially ammonia and potassium, have increased growth and productivity. Potassium apparently had greater influence on pecans in sandy soil than in heavier types.

Root stock studies conducted by H. Mowry suggested that the Rusk and Morton citranges and the citrangequat, all of which may be grown from seeds or cuttings, may have value in Satsuma orange propagation. In strawberry tests the Missionary proved the outstanding variety. Of various forms of Rubus observed, the Florida Marvel, McDonald, Dallas, and an unknown Californian variety proved most satisfactory. Notes are included on various other tests, including extensive grape variety plantings.

As reported by G. H. Blackmon, the greatest growth in pecan nuts of several important varieties occurred in the period from June 24 to August 4, inclusive. On account of an even rainfall the growth curves were smooth and regular.

[Horticultural investigations at the Iowa Station] (*Iowa Sta. Rpt. 1926, pp. 32, 33, 34, 37, 44–46, 47, 48*).—In continuation of work discussed in the preceding report (E. S. R., 55, p. 535) it was found that weather conditions during the growing season may affect the reliability of the dye absorption test as a means of determining hardiness in apples. A dry summer followed by a rainy autumn stimulated a late growth. As a result, all varieties behaved practically in the same manner in respect to the absorption of dye. Studies upon the germination of apple seeds are briefly reviewed (E. S. R., 56, p. 535).

Studies of the economic possibilities of the common milkweed showed that a very good quality of paper may be made from the stem and leaf tissue, and that the seeds are relatively rich in oil and protein and may have value for stock feeding. Fiber suitable for upholstering was obtained, and rubber in small amounts was extracted from the latex.

Observations upon the chemical changes taking place during the ripening of apples showed but little correlation between chemical composition and keeping quality in cold storage. The ripening process, both on the tree and in storage, was associated with loss of moisture, acid, insoluble sugar, and starch and an increase in pectin and soluble sugars. A comparison of high calcium and high magnesium limes as ingredients for Bordeaux mixture showed that a satisfactory reaction results from using large quantities of high magnesium lime but that the amount of sediment is greatly increased. Certain of the standard apple stocks were killed back to the ground in October, 1925. Of those which survived and are being propagated, some were found to root freely from cuttings. Varieties which showed rough excrescences on the limbs and trunk were always easy to root. An anatomical study of these knots showed that the tissue strands traced back to a point of origin in the medullary rays of 1-year wood. Some of the more promising station seedlings are being propagated in large numbers.

Orchard management studies indicate that pruning accompanied by the application of quickly available nitrogen fertilizers is the best means of regulating growth and fruitfulness in the apple and in a partial way at least prevents biennial fruiting. Moderate pruning distributed over the head of the tree gave better results than severe pruning. Three to 5 lbs. of nitrate of soda applied 2 or 3 weeks prior to blossoming proved a satisfactory treatment for Wealthy trees.

Sweet corn studies have resulted in the development of home-grown strains superior in vigor and production to those purchased. Irrigation greatly increased the yield of vegetables during the dry summer of 1925. Many ornamental plants, including white pine, arbor vitae, *Salix babylonica*, *Rosa rugosa*, and weigela, suffered severe winter injury in 1925–26. Douglas fir was found to have value as a plant material for shelter belts. Many varieties of walnuts, pecans, and hickories were collected with a view to determining their value as food and timber.

[Horticultural investigations at the Kansas Station] (*Kansas Sta. Bien. Rpt. 1925–26, pp. 58–64, 65*).—The usual report (E. S. R., 52, p. 440).

Both lime sulfur and Bordeaux mixture were effective in the control of leaf spot in the cherry. In the case of sour-cherry trees, some sprayed with lime sulfur and some with Bordeaux mixture, a larger number of fruits were recorded per pound on the Bordeaux-treated Early Richmond and Montmorency and a considerable less number on the Bordeaux-treated English Morello. Measurements of the length of new growth put forth by cherry branches following the removal of the terminal bud showed greater development both in the distal shoots and the laterals upon the pruned branches. Disbudding experiments with young apple trees showed no significant effect in the first season from the removal of various numbers of buds. Trees disbudded near the base made less diameter gain but the greatest total twig growth.

Soil management studies with the apple indicated that manure alone was more effective than manure plus phosphorus. Rather inconclusive results were obtained with straw mulch on Delicious trees. In one instance the control plat outyielded one of the straw plats. Measurements of growth showed about 40 days of rapid twig extension, while in contrast trunk circumference gain was fairly constant throughout the entire growing period, April to September.

Pruning frozen shoots of Niagara and Moore Early grapes had no beneficial effect as compared with no treatment. Of different systems of training studied, the Kniffin and Munson proved best, respectively, for Concord and Worden, with the fan system poorest in all cases. Of forest trees tested for adaptability to Kansas conditions, *Pinus ponderosa* proved superior to the Austrian and Scotch pines. Red cedar is considered valuable for upland sections. Pecans grown in a fertile soil near Coffeyville reached a productive age at 8 years.

Vegetable plants, VILMORIN-ANDRIEUX & CO. (*Les Plantes Potagères. Paris: Vilmorin-Andrieux & Co., 1925, 4. ed., pp. XX+812, figs. 933*).—This, the fourth French edition of a well-known work, contains descriptive and cultural material on practically all known varieties of vegetables.

Principles to be considered in planning experiments with fertilizers for asparagus, V. A. TIEDJENS (*Jour. Amer. Soc. Agron., 18 (1926), No. 6, pp. 521–525*).—Pointing out that the spring spears of asparagus are necessarily formed largely from reserves stored in the previous growing season, the author suggests the advisability of applying quickly available nitrogen fertilizers after cutting has ceased rather than in the early spring.

[Natural crossing in the tomato], S. V. ANAN'EVA (ANANIEVA) (*Zhur. Opytn. Agron. Ĭugo-Vostoka (Jour. Expt. Landw. Südost. Eur.-Russlands, 3*

(*1926*), *No. 1, pp. 93–96, figs. 8; Eng. abs., p. 96*).—Observations at the Saratov Agricultural Experiment Station upon the progeny of tomatoes which had been grown in close proximity to one another showed a considerable amount of segregation, indicating a large amount of natural crossing. An examination of the flowers of the tomatoes showed that the structure and habit of blossoming favored cross-pollination.

The importance of phosphorus in the production of seed and non-seed portions of a tomato fruit, J. H. MacGillivray (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 374–379*).—Determinations at the University of Wisconsin of the phosphorus content of the seed and surrounding pulp and of the pulp of the outer and intra carpel walls of tomato fruits gathered at various stages of development from plants grown in media differing sharply in phosphorus content showed more total phosphorus in the nonseed portion than in the seed portion, irrespective of the stage of maturity or of the phosphorus nutrient treatment. The percentage of phosphorus was, on the other hand, always greater in the seed portion and higher in young than in ripe fruits. The larger quantity of phosphorus in the nonseed portion of tomatoes is deemed by the author satisfactory evidence that phosphorus is as important in the production of the fleshy part of the fruit as of the seeds.

Tomato culture in Utah, A. L. Wilson (*Utah Sta. Circ. 63 (1927), pp. 36, figs. 2*).—This circular, presenting general information upon tomato growing in Utah, discusses in detail the growing of plants, culture, improvement by plant selection, control of pests, etc.

The fruit garden, A. J. Macself (*London: Thornton Butterworth, 1926, pp. 222, pls. 12, figs. 20*).—This text, illustrated in part in color, contains general information primarily of use to the English home fruit grower.

Orchard irrigation, S. Fortier (*U. S. Dept. Agr., Farmers' Bul. 1518 (1927), pp. [2]+27, figs. 31*).—This publication, a revision of and superseding Farmers' Bulletin 882 (E. S. R., 38, p. 242), contains information on the selection of locations, clearing and grading land, contour method of planting trees, cost and measurement of water, irrigation layouts for orchards, methods of irrigating, water requirements, and winter irrigation of orchards, etc.

Vegetative plant propagation with special reference to cuttings, P. W. Zimmerman (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 223–228*).—A report upon investigations conducted at the Boyce Thompson Institute upon certain environmental factors concerned in the rooting of hardwood cuttings. That aeration is not as important as generally accepted was indicated in good rooting along the entire length of *Lonicera* sp., *Philadelphus* sp., and Salix cuttings planted 2 ft. deep, with a tendency for the strongest roots to appear at the basal end. Of several gaseous atmospheres tested, the best growth was obtained in one composed of from 15 to 33⅓ per cent of oxygen and from 85 to 66⅔ per cent of nitrogen. No rooting occurred where from 90 to 100 per cent of oxygen was present. For Ilex, Delaware grapes, and some species of Viburnum, peat moss proved a better rooting medium than sand. In certain plants the age of the cutting wood determined success in rooting. For example, cuttings of *Prunus tomentosa* rooted well if taken in late May and poorly in the autumn. Certain conifers showed similar peculiarities. Under nonwilting conditions, the larger the leaf area on green wood cuttings the quicker the rooting. Cuttings possessing rooting ability apparently had an optimum rooting temperature. Callus formation was not indicative of rooting ability, as apple, cherry, and blue plum, very difficult rooting forms, callus abundantly. The regularity with which adventitious roots appear about nodes is deemed an indication of the importance of food storage or specialized cell structure at these points.

The propagation of own rooted apple stocks, T. J. MANEY (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 211–217*).—In studies at the Iowa Experiment Station with several apple varieties, including McIntosh, Northern Spy, Fameuse, and Malinda, apple grafts with the stock in sand and the scion in heavier composted soil developed strong scion roots. Scion rooting was induced in Patten grafts by wrapping the union tightly with Bordeaux-treated string, which caused an accumulation of starch above the union. Copper wire had a similar effect in Virginia crab, Hibernal, Dudley, and other varieties of free rooting proclivity. Mound layering gave excellent results with Dudley, Virginia, Hibernal, and Northern Spy, fair results with Wolf River, McIntosh, and Whitney, and negative results with Malinda, Patten, Tolman, and Oldenburg. Bending over and burying 1-year grafts yielded rooted shoots in many varieties. Burr-knots were found to contain an abundant supply of stored starch. Attempts to transmit burr-knot to free trees by scarification of the bark gave negative results. The use of burr-knot wood as scion material was followed by ready scion rooting.

Polarity in the formation of scion roots, W. H. CHANDLER (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 218–222, figs. 2*).—A study at the California Experiment Station of apple grafts made in the normal manner and with a point of union 2.5 and 5 in. above the lower end of the scion showed a tendency in certain varieties, such as Northern Spy, Jonathan, McIntosh, and Delicious, to develop roots on the section of the scion below the graft union. At the same time very little tendency was noted for root formation to take place above the union, suggesting that the stock in some way inhibits rooting above. Rooting was more successful on 2.5 than on 5-in. stubs, but in both cases was insufficient to be deemed a commercial success.

Fruit spur composition in relation to fruit bud formation, G. F. POTTER and H. R. KRAYBILL (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 146–150*).—Three conditions, (1) localization of food materials within the spur, (2) differentiation in the nature of the nitrogen supply, and (3) dominance of the fruit over bud development, are set forth as possible causes for the sharply contrasting blossom-bud performance at the New Hampshire station of Baldwin fruit spurs having essentially the same chemical composition and which, according to the carbohydrate nitrogen-ratio concept of Kraus and Kraybill (E. S. R., 40, p. 40), might be expected to be in a similar reproductive condition. No significant differences in carbohydrate composition were found which could be associated with the percentage of fruit-bud formation except in the content of relatively inert substances such as starch.

Is fruiting of the apple an exhaustive process? A. E. MURNEEK (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 196–200*).—Following earlier studies (E. S. R., 53, p. 142) which showed that a tomato fruit is able to utilize all the available nitrogen supply at the expense of the rest of the plant, the author determined the percentage and grams of total nitrogen in the various parts of the apple-spur system at different stages of development. An expected seasonal decrease in the percentage of total nitrogen was noted for all parts of the spur system, particularly the fruit. When measured in grams of total nitrogen, there was found a definite movement of nitrogen to the fruit. On July 15, when the fruit was half grown, over 80 per cent of the total nitrogen was concentrated in the fruits. The greatest nitrogen increase in the leaves occurred early in the season, at the time of their rapid growth. Defloration or defruiting increased the total quantity of nitrogen in the older wood and in the leaves. Since defoliated spurs are able to set and develop fruits to a considerable size, it is concluded that part of the nutrients are obtained from general reserves

in the tree, or at least further back than the spur system. Fruiting is apparently an exhaustive process, especially in years of heavy production and in years of limited nitrogen supply.

The relation of leaf area to the growth and composition of apples, M. H. Haller and J. R. Magness (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 189–196*).—Studies at Arlington Experiment Farm, Virginia, upon the growth of apples borne on twigs girdled to prevent translocation of carbohydrates indicate that the volume and weight of growth of the fruit is directly correlated with the leaf area upon which the fruits are able to draw carbohydrates. Data taken in the 1925 season indicated that approximately 40, 50, and 75 leaves should be available, respectively, for each Grimes, Ben Davis, and Delicious fruit. Apparently each fruit requires more synthesized food than can be manufactured by the foliage of its own spur. Apples grown with no leaves remained green and made but little gain in size. Those on unringed limbs made somewhat less growth than on ringed limbs, indicating a movement of carbohydrates away from the apples. Apples grown with abundant leaf area were higher in percentage of dry weight, sugars, and acids than those grown with less leaf area.

The first year's effect of different nitrogen fertilizers on bearing apple trees low in vigor, A. L. Schrader and E. C. Auchter (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 150–161*).—Studies at the University of Maryland upon the comparative value of ammonium sulfate and nitrate of soda as sources of nitrogen for apples indicated that bearing trees suffering from a lack of nitrogen respond much more quickly to nitrate of soda, this material apparently becoming available much more rapidly than ammonium sulfate. Observations upon changes in foliage color showed a much more rapid response to nitrate of soda than to ammonium sulfate. Measurement of the terminal growth, trunk circumference increment, and spur growth for the first season following treatment gave definite evidence of the superior value of nitrates. For example, trunk gains for trees receiving 10 lbs. of sodium nitrate, 7.5 lbs. of ammonium sulfate, and nothing were 1.54, 1.14, and 0.81 in., respectively. Where fertilizers were applied in the fall the differences in spur growth were not so marked as with spring treatments. Analyses of total nitrogen in apple spurs showed consistently higher content in spurs of nitrated trees. Nitrate applications made three weeks before blooming actually increased the nitrogen content of the blossoms plus the new growth, while corresponding applications of ammonium sulfate showed no effect. A fairly close correlation was found between the soluble nitrogen content of blossoms plus new growth and spur growth of that year. A relatively high content on June 27 of total nitrogen and soluble nitrogen in the new growth spurs of spring sulfated trees indicates at least a partial availability of that material.

Cross fertilization of the Arkansas (Mammoth Black Twig) apple, E. C. Auchter and A. L. Schrader (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 96–105*).—Failure of the Arkansas apple to set reasonable crops under normal environmental conditions was found in studies at the Maryland Experiment Station to be due largely to self- and intersterility. Applications of Grimes, Stayman Winesap, and Arkansas pollen to Arkansas pistils yielded no fruit, while Delicious, Jonathan, Hubbardston, Yellow Transparent, and some other pollens gave fair results.

Observations in various commercial Arkansas orchards showed that satisfactory fruiting occurs where Delicious and Jonathan are interplanted, but poor fruiting where only Stayman Winesap, Grimes, or York Imperial are present. Unfortunately, Grimes has been used as an interplant in many

Arkansas orchards. Since Grimes pollen germinates well in sugar solutions, poor sets on Arkansas are considered due to cross incompatibility. Inconsistencies in Arkansas fruiting from season to season indicate that nutrient conditions within and without the tree have a bearing on fruit setting in this variety.

Nursery stock identification: Plums, pears, peaches, cherries, W. H. UPSHALL (*Ontario Dept. Agr. Bul. 319 (1926), pp. 31, figs. 33*).—In this contribution from the Vineland, Ont., Horticultural Experimental Station the author discusses, along the lines suggested by Shaw (E. S. R., 47, p. 641), certain distinguishing foliage, shoot, and bud characters which have proved useful in the identification of young nonbearing trees. Numerous photographic reproductions of leaves are included.

Temperature and respiration of ripening bananas, A. J. OLNEY (*Bot. Gaz., 82 (1926), No. 4, pp. 415–426, fig. 1*).—Studies conducted at the University of Chicago upon the ripening of bananas arriving in the green condition from the West Indies indicated that refrigeration at 53.6° F. or lower not only retarded ripening but also permanently prevented the development of bright yellow color, high quality, and aroma, even though the fruits were later transferred to a more favorable temperature. On the other hand, at 63° bananas ripened in 6 days to an attractive condition.

Respiration measurements showed that the volume of carbon dioxide liberated and of oxygen absorbed were practically equal, indicating that oxidation consists solely of the combustion of carbohydrates. The rate of respiration increased rapidly at the beginning of the ripening process and fell off gradually. Respiration was much slower at low than at high temperatures. The amount of heat (0.3 calorie per kilogram per hour) given off by bananas ripening at 68° is deemed sufficient to cause heating, with a consequential too rapid ripening in transit, and emphasizes the urgent need of the ventilation of transportation chambers.

Carnations for every garden and greenhouse, M. C. ALLWOOD (*London: Country Life; New York: Charles Scribner's Sons, 1926, pp. XVI+139, [pls. 65]*).—A comprehensive and well-illustrated discussion upon outdoor and indoor culture of the carnation.

Rhododendrons for everyone, F. K. WARD (*London: Gard. Chron., Ltd., 1926, pp. 122, pls. 16*).—General information prepared by a famous plant explorer is offered upon rhododendron species and varieties and their care.

The flora of South Africa, R. MARLOTH (*Cape Town: Darter Bros. & Co.; London: Wheldon & Wesley, 1913, vol. 1, pp. XVIII+264, pls. 65, figs. 109; 1915, vol. 4, pp. X+208, pls. 60, figs. 62; 1925, vol. 2, sects. 1, pp. XII+1–120d, pls. 42, figs. 75; 2, pp. IV+121–272, pls. 38, figs. 88*).—This contains carefully prepared descriptive material and synoptical tables of the genera of the higher plants, and is illustrated in part in color.

FORESTRY

Soil temperature as influenced by forest cover, T. T. LI (*Yale Univ. School Forestry Bul. 18 (1926), pp. 92, pls. 9, figs. 7*).—Records taken at four contrasting stations, namely, (1) completely denuded area, (2) grassed, (3) young forest, and (4) old forest established in the Yale Demonstration and Research Forest near Keene, N. H., showed that the forest and ground covers are very important factors in influencing soil and air temperature, evaporation, humidity, etc.

The complete denudation of the forest and ground cover resulted in a rapid cooling or heating of the surface soil. In the denuded area the moisture

content in the first 9-in. layer of soil was higher than in any of the other locations. Evaporation, as measured by the Livingston atmometer, was also highest there.

Soil-temperature records taken at 6-, 12-, and 24-in. depths showed fluctuations corresponding to but lower in degree than those occurring at the surface. At 24 in. the soil temperature was less sensitive to surface conditions than at lesser depths. The forest and grass covers significantly lowered the maximum and raised the minimum surface soil temperatures during the hot summer months. The forest reduced the maximum, minimum, and mean soil temperatures at all depths throughout the entire period July 1 to October 31 except that the minimum at 6 in. was raised by the forest in October. The forest exerted a greater influence than did grass in lowering soil temperature, and both the young and the old forest had practically the same effect. As measured by the difference between evaporation of black and white atmometers, sunlight was only 14 per cent of the possible total in the old forest and but 6 per cent in the young forest.

Spruce and balsam fir in the Upper Peninsula, W. MARTIN (*Michigan Sta. Quart. Bul., 9 (1927), No. 3, pp. 99, 100*).—Based on records gathered in a logged-over area in northern Michigan, diameter and height tables are presented for a 60-year growth of spruce and balsam. At 60 years spruce averaged 9.8 in. in diameter and 47.1 ft. in height and balsam 10.6 in. in diameter and 62.5 ft. in height.

The bitternut hickory, Carya cordiformis, in northern Minnesota, A. M. JOHNSON (*Amer. Jour. Bot., 14 (1927), No. 1, pp. 49–51, pls. 3, fig. 1*).—A brief record of the discovery of fine mature trees of the bitternut hickory fully 200 miles farther north in Minnesota than had hitherto been reported.

The palms of British India and Ceylon, E. BLATTER (*London, New York, and Bombay: Humphrey Milford, Oxford Univ. Press, 1926, pp. [12]+XXVIII+600, figs. [163]*).—This comprehensive treatise on palms contains descriptive material, notes on habitat, and utilization of species native and introduced in India.

Notes upon Madagascarian woods [trans. title], M. LOUVEL (*Madagascar Bul. Écon., 23 (1926), I, No. 1, pp. 116–126, pls. 30*).—Descriptions and notes are given upon various species of the genus Eugenia occurring commonly in the forests of Madagascar and recognized by the natives under the collective name Rotra.

The forests of Japan [trans. title], V. F. OVSIANNIKOV (OVSIANNIKOFF) (*Mem. Univ. État Extrême-Orient (Trudy Gosud. Dal'nevostoch. Univ.), 4. ser., No. 2 (1926), pp. 65, figs. 9; Fr. abs., pp. 52, 53*).—A survey of the forests of Japan showed them to occupy about 63.5 per cent of the entire area. Four distinct forest zones occur, namely, (1) subtropical with an average annual temperature of 21° C. (69.6° F.), (2) evergreen zone with a temperature of 12°, (3) broadleaf deciduous zone with a temperature ranging from 6 to 12°, and (4) a coniferous zone with the average temperature below 6°. The most important species are bamboo, evergreen oaks, camphor, beech, *Zelkova acuminata, Cryptomeria japonica, Chamaecyparis obtusa, Thujopsis dolabrata*, and various pines. Forest administration is under governmental control and cutting is mostly upon the continuous yield basis. There are 53 forest schools, but 4 of university rank. A list of the component species is addended.

Forestry in Denmark, A. S. SABROE, trans. by J. SAXE (*Copenhagen: Danish Forest Soc., 1926, pp. 64, figs. 8*).—A small handbook concerning the distribution of the forests, legislative matters, rates of growth of important species, silvicultural practices, statistics and finances, forest institutions, etc.

Statements of progress of forestry in the Empire (In *Imperial Conference, 1926. Appendices to the Summary of Proceedings. London: Govt., 1927, pp. 339–360*).—This contribution consists of brief summaries upon the forestry situation and forest service activities in the various units of the British Empire.

DISEASES OF PLANTS

[Investigations at the Colorado Station on some bacterial diseases of plants], W. C. SACKETT (*Colorado Sta. Rpt. 1926, pp. 17, 18*).—Corroborative evidence has been secured indicating that bacteria are a factor in the recently reported wilt and root rot of alfalfa, *Aplanobacter insidiosum* having been isolated from affected stems and roots of alfalfa.

A bacterial disease of green tomatoes, which manifests itself as a soft, black rot of the fruit, is said to have made its appearance in commercial greenhouses in Denver.

Steam under pressure discharged into soil through perforated pipes is said to have proved very satisfactory for the sterilization of soils in greenhouses and seed beds.

Field experiments were reported to have shown that planting 2-year-old seed greatly reduced the number of bean plants affected with bacteriosis.

[Plant disease investigations at the Colorado Station] (*Colorado Sta. Rpt. 1926, pp. 18, 19*).—Investigations carried on in cooperation with the station bacteriologist are said to have shown that alfalfa plants affected by root rot die through a lack of water induced by a plugging of the water ducts with a pentosan gum. This is said to reduce the water supply to one-fourth the normal requirement, resulting in a wilting and failure of starch production and storage. It is said that such plugging can be produced independent of the organism by the use of certain salt solutions.

Tests were reported on the control of stinking smut of wheat, in which 2,500 test plats were used in a comparison of the effect of copper carbonate with formalin, copper sulfate, and a number of commercial compounds. Temperature and growth records gave valuable data on conditions of infection of wheat. Tests were also made on treatments for sorghum smut, etc., in which copper carbonate was used successfully.

Spraying and dusting experiments for the control of cucumber mildew were successful in greenhouses near Denver, but field tests for the control of mildew on pumpkins showed that while control was effected the treatment was too expensive.

Report of plant pathologist, O. F. BURGER (*Florida Sta. Rpt. 1926, pp. 68, 70–80, 81–83*).—Laboratory work by K. W. Loucks showed that when citrus seed was planted in soil inoculated with *Bacterium citri* the resulting plants were not infected. However, young kumquat and grapefruit seedlings inoculated soon after sprouting were readily infected.

Field and laboratory investigations of scaly bark of citrus were made by E. West. It is claimed that this disease can be controlled by pruning in conjunction with good grove management. Attempts were made to isolate the causal organism, and of a considerable number of fungi obtained a Cladosporium was secured that resembled the species which is claimed to cause the disease. Inoculation experiments, however, gave negative results.

Continued studies by A. S. Rhoads of citrus blight have confirmed the opinion that this trouble is due to extremes of soil moisture conditions.

The temperature and moisture relations of pecan scab were investigated by R. E. Nolen. Spore germination was secured at from 6 to 32° C., with an

optimum temperature of from 20 to 22°. The incubation period in a greenhouse at Madison, Wis., was from 7 to 15 days, while in the field at Gainsville, Fla., it was from 4 to 21 days.

Studies of coconut diseases by J. L. Seal consisted mainly of isolations of the fungus connected with bud rot. Several strains of *Phytophthora faberi* were isolated and successfully inoculated into coconut trees. No correlation was found between temperature and outbreaks of coconut bud rot, but definite correlations were established between rainfall and disease occurrence.

Investigations of truck crop diseases and their control by G. F. Weber revealed an unusual freedom from serious infection during the year. Powdery mildew of cucumbers was rather destructive, and experiments on its control by spraying and dusting were undertaken but without definite results. Angular leaf spot of cucumbers was satisfactorily controlled by dusting or spraying. Experiments with various fungicides for the control of seed-borne diseases of tomatoes, eggplant, and pepper indicate the value of seed treatment with corrosive sublimate 1:1,000 for about 8 minutes. An extensive spraying and dusting experiment for the control of nailhead rust of tomatoes gave negative results, owing to the scarcity of the disease.

Potato disease experiments by L. O. Gratz included seed treatments, symptoms, and yields of Maine selected samples diseased with mosaic, spindle tuber, and Verticillium wilt. Corrosive sublimate was compared with various organic mercury compounds in tuber treatment experiments with little benefit from any of the treatments except Semesan. Spraying and dusting experiments are said to have indicated some superiority in favor of spraying. Tests of two lots of seed tubers, one infected with spindle tuber and the other with Verticillium wilt, when grown in comparison with healthy stock showed diminished yields, especially with the lot infected with spindle tuber. Experiments with copper-lime dust for the control of blight were disappointing, as the disease was not a factor during the season.

An investigation of strawberry diseases in Florida was begun by A. N. Brooks. A preliminary report is given of a yellowing and dying of the plants, which is believed to be connected with the application of lime to the soil.

Plant pathology (*Iowa Sta. Rpt. 1926, pp. 30–32*).—Test plats were studied to determine the effect on the succeeding crop by planting seed infected with the dry-rots *Diplodia zeae* and *Basisporium gallarum*. Corn infected with these fungi was planted with corn practically free from molds, and the results showed that seed practically free from dry-rots gave a better stand, more vigorous plants, fewer nubbins, fewer barren stalks, and a higher yield than did infected seed. Seed heavily infected with Diplodia dry-rot was improved when treated with any of several compounds, but the infected treated seed in no case yielded as much as seed practically free from dry-rot, selected by the modified rag-doll test.

Investigations of aster wilt are said to indicate that the Fusarium which causes aster wilt is different from the species causing cabbage yellows. Tests of varieties showed certain ones to have a higher degree of resistance than others.

The investigations on mosaic disease, conducted to determine the specific nature of the virus from certain species of plants, are said to indicate that three distinct mosaic viruses were studied. All were transmitted to tobacco and their differences observed. One of these is the commonly known mosaic of tobacco and the other Solanaceae, which is capable of withstanding desiccation for long periods and appears to be restricted to the Solanaceae and to zinnia. Another form is the virus causing mosaic of cucumbers and other

plants, which appeared to be capable of infecting a wide range of hosts belonging to numerous orders and families. The third virus, from sweet clover, was distinct as to symptoms produced on tobacco, and transmission to any species except tobacco was not successful.

Studying rust resistance of oat hybrids, 26 F_7 selections from a cross between Iowa 105 and Green Russian gave an increased yield of from 17 to 44 per cent compared with Iowa 105.

Isolations from crown gall and other overgrowths of apples showed that all such knots are not caused by microorganisms. Viable crown gall bacteria were obtained from less than 20 per cent of the overgrowths. The others were found to be caused by imperfect graft unions. Organisms were found in the overgrowths at the union of apple trees that closely resembled the crown gall bacteria, but they failed to produce typical galls when inoculated into healthy tomato plants. Further studies of other excrescences resembling crown gall, especially burrknots, have not shown the presence of crown gall bacteria.

Field tests in 1925 of the cabbage variety Iacope are said to have shown that it was very resistant to cabbage yellows and satisfactory as to type and time of maturity.

For the control of wheat bunt nine different fungicides were tested in various strengths, and the results are said to indicate that copper carbonate was very effective for the control of this disease. Some of the other fungicides used gave as good control, but additional data are considered necessary before recommending them for use.

Diseases of plants (*Kansas Sta. Bien. Rpt. 1925–26, pp. 65–71*).—Investigations of cereal and forage crop diseases have resulted in the production of a number of F_2 and F_3 plants of a Kanred×Fulcaster cross, some of which are said to be very promising for leaf rust resistance. The inheritance of resistance to leaf rust was studied, and it was found that while resistance was recessive in the seedling stage, it was apparently dominant in the heading stage. Plants that were immune in the seedling stage did not change later in their reaction to rust. It was found that true immunity was recessive and apparently due to a single main factor difference. The effect of leaf rust on yield was studied, using potted plants grown in the greenhouse, and, in general, there was found to be a reduction in yield, but the nature and cause of the reduction were not fully determined. Dusting wheat with sulfur both in the greenhouse and in the field was found to prevent leaf rust infection.

On stinking smut a study was made on the date of planting and the effect of recontaminating treated seed with smut by soil and seed inoculations. Early plantings in September while the soil is warm resulted in little or no smut, while plantings in October and up to the middle of November gave the highest infection. Various brands of copper carbonate were tested, and those containing from 50 to 55 per cent copper gave the best smut control, especially when seed wheat was badly infected. Seed wheat treated with copper carbonate and afterwards heavily recontaminated with smut spores was infected by smut, indicating that copper carbonate did not necessarily protect against recontamination.

Wheat foot-rot disease is said to have assumed a serious aspect. Investigations show that *Ophiobolus graminis* is present where wheat foot rot occurs, and other organisms, such as *Helminthosporium* spp. and *Wojnowicia graminis*, have been isolated from infected plants. Five seasons' observations are said to show that early deep plowing favors the spread of the disease, while late shallow plowing, disking, or merely removing the weeds suppresses it. No resistance to *O. graminis* has been found in any variety of wheat.

In experiments for the control of oat smut satisfactory control was secured with a number of organic mercury and phenol compounds, but they did not prove as reliable as the formaldehyde soaking treatment. Furfural gave no smut control in hulled oats, and copper stearate failed to control smut in either hulled or hull-less varieties. Dusting treatments with copper carbonate and various forms of sulfur are said to have given excellent smut control in hull-less oats, but both were ineffective when used with a hulled variety. Experiments on the effect of dehulling the oat kernels on smut infection showed that the glumes of oats are a great natural protection to susceptible varieties.

A kernel smut of dwarf yellow milo was found at the Colby Substation, and this is said to be the first time a kernel smut has been reported on milo. All varieties of sorghum, with the exception of feterita, are considered subject to attack by milo smut. Experiments for the control of the kernel smut of sorghum showed that copper carbonate in various forms and several brands of superfine sulfur gave nearly as good control as the formaldehyde treatments. Copper stearate and collodial copper failed to give satisfactory smut control, but some of the organic mercury compounds proved promising.

In corn smut investigations a number of inbred lines were studied, and several have been secured that are considered quite resistant to smut, while others are extremely susceptible. Physiological studies on the corn smut organism *Ustilago zeae* indicate the possible existence of physiologic forms. Copper carbonate and sulfur dusts are said to have exerted some effect on the control of smut on sweet corn.

Several root rot diseases of alfalfa have caused serious damage in Kansas, one of which, the bacterial disease known as wilt, is said to be widespread.

In the fruit and vegetable disease investigations 3 minutes in the hot formaldehyde solution in sacks was found as effective for the control of Rhizoctonia in seed potatoes as corrosive sublimate for 90 minutes. Sulfur did not materially reduce the amount of Rhizoctonia on the stems. Copper dusts as a group gave slight control, but all caused a stunting of the plants. One of the organic mercury dusts gave excellent control, but two others were valueless.

Experiments indicated that neither sulfur alone nor green manure crops alone can be relied upon to control potato scab economically. The symptoms of mosaic are said to be masked in Kansas by the high temperature during the growing season, nevertheless plants carrying the disease, although appearing healthy, are greatly reduced in yield. Spindle tuber of potato is considered of greater economic importance in Kansas than mosaic.

Tests are reported of varieties or strains of tomatoes resistant to wilt, a disease caused by *Fusarium lycopersici*. Rhizoctonia crown rot of carrots is said to have been locally severe and destructive near Kansas City. The fungus was found to be weakly parasitic, causing serious loss only under very humid conditions and at fairly high temperatures.

Under Kansas conditions varieties of cabbage which are resistant to cabbage yellows are not considered desirable from the standpoint of type and date of maturity. Experiments are in progress with commercial Copenhagen and Golden Acre, popular early varieties susceptible to yellows, to secure, if possible, an early wilt-resistant type of cabbage.

A disease of apple trees caused by *Stereum purpureum* has appeared in the northeast section of the State.

Plant disease investigations [in British Guiana], R. A. Altson (*Brit. Guiana Dept. Sci. and Agr. Rpt. 1924, pp. 45–53*).—This account deals with sugar cane root disease, top rot, chlorosis, ring spot, pineapple disease, and leaf sheath red spot; coconut bud rot and red ring; rice blast; plantain (moko) dis-

ease; cacao witch-broom disease; coffee wilt; Para rubber endemic leaf disease; and mango anthracnose.

The more injurious fungus parasites of plants cultivated in the Provinces of Turin, Cuneo, and Novara, 1922–23 [trans. title], P. Voglino (*Ann. R. Accad. Agr. Torino, 67 (1924), pp. 93–99*).—About 40 fungus parasites of plants of economic significance are listed, as are also the Schyzomycetes *Pseudomonas phaseoli* and *P. campestris* and the dodders *Cuscuta epithymum* and *C. pentagona*.

Studies in the physiology of parasitism.—X, The growth reactions of certain fungi to their staling products, C. Boyle (*Ann. Bot.* [*London*], *38* (*1924*), *No. 149, pp. 113–135, figs. 5*).—The present study is a continuation of the series previously noted (E. S. R., 47, p. 349; 49, p. 240).

Fusarium sp. grown on Richards' solution, potato extract, or apple extract soon renders the medium unsuitable for further growth. This toxic action of Fusarium growth products is not specific, as is shown by the fact that *Botrytis cinerea* spores are more susceptible than are Fusarium spores to the metabolic products of *Fusarium* sp. Details are given. "Within wide limits the pH value of a staled solution does not appear to be a limiting factor in growth." Filtration through a 90 per cent collodion membrane removes some of the toxic properties from a staled medium. The toxic substances in such a medium are partly deactivated by precipitation with alcohol, the reconstructed medium appearing less stale than the original.

[**Soil sterilization in greenhouses**] (*Kansas Sta. Bien. Rpt. 1925–26, p. 64*).—The value of steam soil sterilization was investigated in experiments in which 20-, 40-, and 60-minute treatments were employed. The 60-minute treatments are considered the most practical, and under the conditions of the experiment such sterilization is found to cost about 10 cts. per square foot for the treatment.

Plant diseases due to smut fungi, P. C. Bolle (*Die Durch Schwärzepilze* (*Phaeodictyae*) *Erzeugten Pflanzenkrankheiten. Proefschr., Rijks-Univ., Utrecht, 1924, pp. 77, pls. 3, figs. 2*).—This Utrecht University thesis on plant smut fungi (Phaeodictyae) consists of the phytopathological and the mycological part, each having four chapters.

Infection tests with Erysiphaceae [trans. title], S. Blumer (*Centbl. Bakt.* [*etc.*], *2. Abt., 65 (1925), No. 1–5, pp. 62–70*).—This account deals with studies and their results as applying to *Erysiphe polygoni* on Ranunculaceae, Umbelliferae, and Papilionaceae, *Microsphaera bäumleri* on *Vicia silvatica*, and *M. astragali* on *Astragalus glycyphyllus*, with a general statement as to the specialization of *E. polygoni*.

Studies of the genus Fusarium.—I, General account, W. Brown and A. S. Horne (*Ann. Bot.* [*London*], *38* (*1924*), *No. 150, pp. 379–383*).—Details are reported, and work in progress is indicated.

The physiology of Fusarium coeruleum, E. S. Moore (*Ann. Bot.* [*London*], *38* (*1924*), *No. 149, pp. 137–161, pls. 2, figs. 10*).—Examination of the growth rate of *F. coeruleum* at different temperatures has been effected by determination of dry weight of mycelium in liquid culture, diameter of colony on solid media, and length of germ tube of conidia in germination drops. The maximum is near 30°, the minimum slightly below 5° C. (41° F.). Conidia are killed by heating for 10 or 15 minutes in water at 45–46°, or for a longer period at a lower temperature. Treatment which is insufficient to kill the spores may still delay germination. The maximum acidity tolerated is around pH 3.0. Marked morphological change occurs in growths between pH 3.0 and 3.5, but growth is still possible at pH 10.5. The fungus utilized glycerol, salts of tartaric, citric,

and acetic acids, and carbohydrates, but not oxalates or formates. As nitrogen sources, asparagin and certain salts of some organic and inorganic acids are utilized. Concentrations, both absolute and relative, of the nitrogen and carbon supplying compounds influence both type and amount of growth. Phosphate concentration has relatively little influence. The fungus secretes diastase, invertase, and cytase. The existence of both varietal and seasonal differences in the susceptibility of tubers has been confirmed. These differences appear to be due neither to the varying sugar content nor to differences in acidity of the expressed juice. They are not attributed to any differences in the cell walls of susceptible as opposed to resistant tubers when acted upon by an extract of the fungus.

The grass rusts of South America, based on the Holway collections, J. C. ARTHUR (*Amer. Phil. Soc. Proc., 64 (1925), No. 2, pp. 131–223, figs. 10*).—The present account, a contribution from the botanical department of the Indiana Experiment Station, is the result of study based on some of the extensive rust collections made in South America during 1919–1922 by E. W. D. Holway, with the assistance of his wife. Included in this presentation are a bibliography of South American grass rusts, a species key, and a rust index.

A new disease of the Gramineae, Pleosphaeria semeniperda nov. sp., C. C. BRITTLEBANK and D. B. ADAM (*Brit. Mycol. Soc. Trans., 10 (1924), pt. 1–2, pp. 123–127, pls. 2*).—In 1919 an outbreak, at first designated as take-all, was reported as present on both wheat and oats at Hopetoun, Victoria. The associated fungus, as regards the ascomycetous form, is said to belong in Pleosphaeria, the conidial form agreeing closely with *Podosporiella verticillata*, perhaps identical with this.

The perfect stage, *Pleosphaeria semeniperda*, is said to have been first observed on *Avena fatua*. Further occurrences are noted as involving *Bromus sterilis* and *A. sativa*.

Physiologic specialization and parasitism of Helminthosporium sativum, J. J. CHRISTENSEN (*Minnesota Sta. Tech. Bul. 37 (1926), pp. 101, pls. 12, figs. 2*).—Results are given of an extensive study of the Helminthosporium disease of cereals, with special attention to that of wheat and barley, caused by *H. sativum*. This species is widespread and destructive. It is a common inhabitant of the cereal seeds, the amount varying with locality, year, and variety. More than 1,000 isolations were made from wheat plants affected with basal stem rot, and *H. sativum* was the most prevalent organism.

Numerous physiologic forms of *H. sativum* were recognized and 37 studied in detail. These forms are distinguished in cultural as well as pathogenic characters. Asexual mutation was found to occur in some forms, and reversions apparently occur, but when they do they are always in the form of sectors. The mutants differ from their parents not only in morphological characters but also in pathogenicity, some being decidedly more virulent than the parents. Light is not considered necessary for the formation of spores. The optimum temperature for sporulation for Form I was between 16 and 25° C., the maximum about 29° and the minimum about 10°. The conidia of *H. sativum* were found to remain viable for a long time under proper conditions, several forms remaining viable for three years. The longevity of the spores is said to depend somewhat on the physiological form concerned, although environmental conditions have a greater effect. Spores of Form I were found to withstand exposure to both low and high temperatures for considerable periods of time if the relative humidity was low. Aeration is important in determining the length of time conidia can remain viable. Spore germination is influenced by slight changes in environment. The virulence of Form I was not attenuated as a result of growing six years on artificial media.

The development of the Helminthosporium disease on cereals is said to depend on several factors: The physiologic forms present, the amount of inoculum produced, the effect of environmental factors in the development of the pathogene, varietal susceptibility, and factors predisposing the host. Many dust and liquid fungicides were used in an attempt to destroy the mycelium of *H. sativum* in the seeds of wheat and barley, but none were entirely effective. Treating the seed with fungicides did not affect the rate of growth of seedlings nor did it control root rot and basal stem rot or increase the yields when the seed was sown in soil in which the organism was present. All varieties of Triticum investigated became infected with root rot and basal stem rot, but there were great differences in susceptibility, the durum wheats, in general, being the most susceptible.

Breeding wheats resistant to flag smut, J. P. SHELTON (*Agr. Gaz. N. S. Wales, 35 (1924), No. 5, pp. 336–338*).—In 1921 several American winter wheat varieties were reported by Tisdale and Griffiths (E. S. R., 45, p. 245) to possess quite marked resistance to flag smut. Seed of a number of such varieties were secured and were planted April 15 and May 25, 1922, alternate rows being sown with inoculated seed with a very susceptible Cleveland wheat for the purpose of comparison. The test was repeated in 1923.

The results for the two years are tabulated, and indicate that while some of the varieties tried are rather more resistant to flag smut than the New South Wales varieties, Galgalos alone showed sufficient merit to warrant its use as a resistant parent in breeding experiments. In 1923 this variety was crossed with Canberra, Cleveland, Federation,, and Yandilla King, and material for extensive breeding tests was obtained. In 1923, also, 14 additional varieties were forwarded from the United States as highly resistant to flag smut, and trials with these also were projected.

Wheat pickling, H. A. MULLETT (*Jour. Dept. Agr. Victoria, 23 (1925), No. 5, pp. 283–288*).—Pickling seed wheat in Victoria to prevent ball smut, while comparatively effective as regards prevention of infection, causes loss of about 25 per cent of the seed and retards germination considerably. The new dry process, as carefully tested out, depends for its effectiveness on the purity of the copper carbonate and on its covering capability. Dilution with lime or gypsum showed a proportionate loss of effectiveness. Very fine powders fly into the air better than do coarse powders, they get into the crease and brush better, and they are more effectively distributed over the grain so as to come near the smut spores. Details are given.

Treatment of wheat for smut, A. E. V. RICHARDSON (*Jour. Dept. Agr. Victoria, 22 (1924), No. 4, pp. 224–230*).—Comparative tests indicated are considered to show that finely pulverized fungicidal dusts (copper carbonate and copper sulfate) are superior to the standard fungicidal solutions as treatments of wheat seed for protection from smut. Copper carbonate effectively kills smut spores without the depressing effect on germination and vitality that is caused by the standard solutions of formalin and copper sulfate, especially where the sowing is delayed after treatment. It is usually sufficient when used at the rate of only 2 oz. per bushel where the infection with bunt spores is not very heavy. The cost of materials, though comparatively high, is more than offset by the advantages.

Finely pulverized copper sulfate is nearly as advantageous. It is more effective than is copper carbonate for killing smut spores, but it affects slightly the vitality of the seed, though not so much as does the standard solution.

Control of seedbed diseases of cruciferous crops on Long Island by the mercuric chloride treatment for cabbage maggot, E. E. CLAYTON (*New York

State Sta. Bul. 537 (1926), pp. 29).—A report is given of experiments conducted during the years 1923, 1924, and 1925 to determine the disease-control value of the corrosive sublimate treatment for maggots when used in cabbage, cauliflower, and Brussels sprouts seed beds. Long Island farmers who treat their seed beds for maggot control are accustomed to making two applications and sometimes three. In the experiments reported the number of applications was generally two or three. Clubroot infection was reduced to a low minimum by applications of corrosive sublimate solution. Two applications were generally quite effective, but in one experiment a single treatment given just as the plants were showing first true leaf reduced the amount of clubroot from an average of 66.3 per cent in the untreated checks to 2.6 per cent in the treated plats. Corrosive sublimate appeared to be equally effective in dilutions of 1:2,000 or stronger. Organic mercury preparations proved as effective against clubroot and were less likely to injure the plants, but they were inferior to corrosive sublimate in controlling maggots.

Two to three seed-bed treatments gave marked control of blackleg in all but one of the experiments in which the blackleg infection was seed borne. Where the source of the blackleg infection was the soil and not the seed, the seed-bed treatments were ineffective. The results secured in the black rot experiments were similar to those secured with blackleg. Seed-bed treatments as used in these experiments failed to control damping-off, and it is believed that under the conditions treatments would have to begin with the appearance of the plants above ground to check this disease.

Considering the results as a whole, it may be said that the disease-control properties of the corrosive sublimate treatment as used for cabbage maggot are very considerable, in that danger from clubroot is greatly reduced and that blackleg and black rot infections carried with the seed are largely destroyed.

Corn disease studies (*Iowa Sta. Rpt. 1926, pp. 61, 62*).—The relation of the mildew disease caused by *Sclerospora graminicola* on foxtail grass to corn was studied. Oospores of *S. graminicola* produced infection on 15 varieties of field corn, 6 varieties of pop corn, and 5 varieties of sweet corn. By inoculating sterile soil with oospores and planting the grain, the infecton was manifest in from 8 to 10 days after planting. Oospores have not been found on corn.

Ear rot of maize, H. Tryon (*Queensland Agr. Jour., 25 (1926), No. 3, pp. 237–258, figs. 22*).—This memoir indicates that the trouble which has hitherto been regarded by farmers in Queensland as a form of deterioration of the mature maize grain, and has been called locally moldy or mildewed corn, is a disease of the growing plant due to *Diplodia zeae*. Supposedly, infection occurs at silking time and is favored by rainfall. No kind of maize is known to be immune. Alternation appears to be the most hopeful control measure.

Blackarm disease of cotton, with special reference to its epidemiology in the Sudan, R. G. Archibald (In *Report of a Meeting in the Sudan Gezira in Dec., 1925, for the Discussion of . . . Cotton Growing. Khartum: Wellcome Trop. Research Labs., 1926, pp. 9–14*).—The cotton stem blight commonly referred to as blackarm, the leaf disease known as angular leaf spot, and the capsule spot known as boll rot are mentioned as localizations of one and the same infection, the causal organism being *Bacterium malvacearum*. This disease has, it is thought, existed in the Sudan for many years, escaping attention earlier owing to the comparative harmlessness which has characterised its presence until recent years.

The organism resists feebly sunlight, desiccation, or heat. The infection is carried within the seed coats, which renders seed treatment ineffective. The

organism has not been found in soil or water. It is probably not carried by insects. No hosts other than cotton have been found. Predisposing factors include unsuitable soil or climatic conditions and bad agricultural methods. Storage of cottonseed appears to lessen the liability of transmission.

[Flax rust], G. RUSCHMANN and W. BAVENDAMM (*Centbl. Bakt.* [*etc.*], *2. Abt.*, *65* (*1925*), *No. 1–5*, *pp. 43–58*, *figs. 2*).—An account is given of flax rust associated with *Plectridium pectinovorum* (*Bacillus amylobacter*) and *B. felsineus*.

Studies on the nature of wilt resistance in flax, C. I. NELSON and M. DWORAK (*North Dakota Sta. Bul. 202* (*1926*), *pp. 30*, *figs. 25*).—In a study on the nature of wilt resistance in flax the authors obtained globulins from the seed of two varieties, one of which was resistant to wilt and the other susceptible. The globulins were found to separate into two fractions, one dark in color and the other quite light. Precipitin tests made with sera produced against the various fractions, both singly and in groups, are said to indicate the high specificity of the homologous fraction and also the high specificity of the homologous group of fractions. The data do not indicate which fraction carries the greater amount of the specificity for the plant variety.

Resistance to wilt is considered to be a definite flax variety characteristic inasmuch as it is associated definitely with the globulin fractions. Whether the resistance is a result of the globulin structure or not is still to be determined.

The downy mildew of the hop, [I], II, E. S. SALMON and W. M. WARE (*Jour. Min. Agr.* [*Gt. Brit.*], *31* (*1925*), *No. 12*, *pp. 1144–1151*, *pls. 3*, *figs. 2*; *32* (*1925*), *No. 1*, *pp. 30–36*).—Hop downy mildew (*Pseudoperonospora humuli*), considered when first reported (E. S. R., 52, p. 747) as an introduction, is now viewed as a result of more recent disclosures as probably native to the hop in England. The present article describes the fungus and its effects on cultivated hops.

Investigations have shown that the downy mildew which is common on nettles is almost identical with that on hop, and it is thought that the causal fungus can pass from either plant to the other. Theories are advanced as to the recent behavior of the fungus in this locality.

Three diseases of cultivated mushrooms, F. E. V. SMITH (*Brit. Mycol. Soc. Trans.*, *10* (*1924*), *pt. 1–2*, *pp. 81–97*, *pls. 2*).—Mushrooms in England are subject to disease attributed to any of three parasitic fungi, *Mycogone perniciosa*, *Cephalosporium costantinii*, or *C. lamellaecola*, the last two having been described in the present article as new species by the author. Sclerodermoid mushrooms may be produced by either *C. costantinii* or *M. perniciosa*. The pathology of the latter fungus has been investigated in detail, and the fungus has been shown to be distributed by infected soil or spawn, each mushroom being infected directly from the soil when young. *M. perniciosa* may be controlled by fumigation or by spraying with formalin or lysol and by soil sterilization.

The control of onion smut, N. L. ALCOCK, A. E. S. M'INTOSH, and G. B. WALLACE (*Scot. Jour. Agr.*, *9* (*1926*), *No. 1*, *pp. 65–70*).—Onion smut (*Urocystis cepulae*), said to have been recognized in the United States since 1869 and in Great Britain for 12 or 15 years though probably present much longer in the north of England and south of Scotland, attacks both onion and leek in the Edinburgh districts.

Experiments with formalin solution, 2 oz. per gallon of water, applied in the furrow while seeding at 1 gal. per linear yard, carried out from April to September, 1925, showed that though a small amount of disease may escape

the treatment practical control of the disease may be obtained. The majority of the plants remained healthy and the crops more than doubled in weight.

Potato leaf-roll, G. H. PETHYBRIDGE (*Jour. Min. Agr.* [*Gt. Brit.*], *31* (*1924*), *No. 9, pp. 863–869, pl. 1*).—A brief historical account is given of potato running-out diseases in England and neighboring territory, with more particular reference to the recent losses by leaf roll. In affected plants, food manufacture and translocation are interfered with. Aphids carry the disease material, the precise nature and the causal agent of which are not known. Seed selection, roguing, aphid control, and early digging assist greatly in controlling the disease.

On a curious effect of mosaic disease upon the cells of the potato leaf, K. M. SMITH (*Ann. Bot.* [*London*], *38* (*1924*), *No. 150, pp. 385–388, figs. 4*).—"During a critical search of the tissne of mosaic-infected potato leaves, the writer noticed the almost invariable presence, in the leaf cells, of a number of peculiar amoeba-like bodies. It is the purport of this note to give an accurate description of these bodies."

Diseases of sugar cane in Mauritius, E. F. S. SHEPHERD (*Mauritius Dept. Agr., Gen. Ser. Bul. 32* (*1926*), *pp. 18, pls. 10*).—This publication presents a list of the principal sugar cane disease in Mauritius, a description of each disease, and appropriate control measures.

[Report of tobacco disease investigations in Florida], W. B. TISDALE (*Florida Sta. Rpt. 1926, pp. 105–109*).—In a series of fertilizer experiments with shade tobacco on acconnt of soil infestation with the organism causing black shank, a strain of Big Cuba tobacco was planted which showed considerable resistance to the disease. Nematode infection was prevalent, and it is considered to be a factor in the invasion of the roots by the black shank organism.

Additional work was carried on in testing varieties and strains of tobacco for resistance to black shank. No commercial type of tobacco, except *Nicotiana rustica*, was found immune to the disease. Selections of Big Cuba and an F_4 selection of a cross between Big Cuba and Porto Rican are reported to be almost completely resistant, and the type appears to be fixed.

Investigations on the overwintering of wildfire are said to indicate that the causal organism (*Bacterium tabacum*) may possibly winter over in the soil of seed beds on low wet land. No evidence was found of the overwintering of wildfire in upland seed beds.

Brief notes are given of the occurrence of black fire, root knot, mosaic, and stem injury caused by fermenting poison mixture.

The blue mould (Peronospora) disease of tobacco, D. B. ADAM (*Jour. Dept. Agr. Victoria, 23* (*1925*), *No. 7, pp. 436–440*).—An account of sprayiug and manurial tests and studies on resistance, the importance and rôle of the oospore, and meteorological data emphasize the importance of continuing attempts to produce resistant plants, of cleaning all seed before sowing, and of destroying early all remaining plants and early destruction of old plants and refuse in the tobacco field.

A Rhizoctonia disease of Vigna, C. H. GADD and L. S. BERTUS (*Ceylon Dept. Agr. Yearbook 1926, pp. 31–33, pls. 2*).—The extended cultivation of *Vigna oligosperma* as a cover crop has favored *R. solani*, which attacks this and various other economic plants here indicated. Studies were carried out to see whether this fungus might prove to be serious as a local disease.

The experiments show that it may be difficult to raise healthy plants from seed on soil infected with *R. solani* (*Corticium vagum*). No likelihood appears of the disease spreading to Hevea, tea, coconuts, cacao, or other woody plants, though it is said to be a serious disease on many herbaceous plants.

A method of inoculating the apple, K. GRANGER and A. S. HORNE (*Ann. Bot. [London], 38 (1924), No. 149, pp. 212–215, figs. 6*).—The particulars, bearings, and limitations are indicated regarding a method of inoculation said to be applicable to apples but not to potatoes.

Blister canker (*Iowa Sta. Rpt. 1926, p. 47*).—Studies on the control of blister canker are said to indicate that it can be controlled quite efficiently by tree surgery methods. It is recommended that the diseased portions be chiseled out and the surface painted with a paint made from white lead mixed with raw linseed oil to which is added 0.5 oz. of powdered corrosive sublimate to each quart of mixed paint. Some paints with an asphaltum base were also found to be efficient as disinfectant coverings for the canker treated wounds.

Trials with controls for apple mildew, W. LE G. BRERETON and H. BROADFOOT (*Agr. Gaz. N. S. Wales, 35 (1924), No. 3, pp. 209, 210*).—Recommendations resulting from tests outlined as to control of apple mildew include winter destruction of mildewed twigs, spraying with atomic or atomized sulfur (12 lbs. to 100 gal. of water) or colloidal sulfur at the spur-bursting stage, and spraying with atomic or atomized sulfur (12 lbs. to 100 gal. of water) or colloidal sulfur combined with lead arsenate at the times when the latter is to be applied.

Polyporus adustus (Willd.) Fr. as a wound parasite of apple trees, F. T. BROOKS (*Brit. Mycol. Soc. Trans., 10 (1925), pt. 3, pp. 225, 226*).—Preliminary study indicates that *P. adustus* (ordinarily a saprophyte on broad-leaved trees) is the cause of an apple tree disease, which is briefly noted. Stockholm tar and gas tar proved to be wholly ineffective as protective coverings.

Apple and pear scab, E. S. SALMON and W. M. WARE (*Jour. Min. Agr. [Gt. Brit.], 31 (1924), No. 6, pp. 546–554, pls. 3*).—Recent studies are said to have shown that in this as in other fruit-growing countries the apple scab fungus (*Venturia inaequalis*) and the pear scab (*V. pyrina*) develop a winter stage in the dead scabbed leaves on the ground. The resulting winter spores are expelled in the spring and infect the young leaves and fruit, reproducing the scab. This fact emphasizes the necessity for suitable and timely spraying.

Spraying experiments against apple scab, N. B. BAGENAL, W. GOODWIN, E. S. SALMON, and W. M. WARE (*Jour. Min. Agr. [Gt. Brit.], 32 (1925), No. 2, pp. 137–149, pls. 2*).—Spraying experiments against scab, or black spot, carried out during 1923 and 1924 in a commercial plantation at Egerton, Kent, are described. These were applied to bush apple trees planted in 1915, principally of the variety Bismarck, this variety being extremely susceptible to scab as regards both leaves and fruit.

The sprayings, as outlined, employing either of the three fungicides, Bordeaux mixture, lime sulfur, and lime sulfur plus lead arsenate, controlled scab to a marked extent, without serious leaf injury or fruit russeting, though there was some dropping of young fruits in case of the last two preparations named.

Apple rot fungi in storage, M. N. KIDD and A. BEAUMONT (*Brit. Mycol. Soc. Trans., 10 (1924), pt. 1–2, pp. 98–118, pls. 2*).—A systematic account is given of apple rot storage fungi based on examination of all rots developing during the seasons 1921–22 and 1922–23. Forms named, with technical descriptions, as new species include *Phoma fuliginea*, *P. bismarckii*, *Oospora mali*, *Cephalosporium malorum*, *Hyalopus albidus*, *Sporotrichum malorum*, *Tilachlidium cinnabarinum*, and *Graphium malorum*. A few varieties claimed to be new are indicated.

Cold storage for Iowa apples (*Iowa Sta. Rpt. 1926, pp. 46, 47*).—In cooperation with the chemistry section of the station a comprehensive study was made on the acidity of apples under cold storage conditions to determine whether there was a correlation between the rate of loss of acidity and the development

of such storage troubles as scald, breakdown, and Jonathan spot. It was found that fruit stored at temperatures of from 30 to 32° F. are more apt to breakdown and soft scald than fruit stored at slightly higher temperatures. An investigation of the cold storage trouble known as Jonathan spot showed that the black spots are caused by a color change in the pigment around the lenticels. H-ion determinations indicate that the spotted areas are less acid than the normal skin, which has a clear red color. By treating spotted apples with fumes of hydrochloric acid, the original color is restored. In experiments in which impregnated wraps were used the percentage of Jonathan spot was reduced from 44 to 7 per cent.

The dwarfing, shriveling, and dropping of cherries and prunes, W. O. GLOYER (*New York State Sta. Bul. 540 (1926), pp. 18, pls. 4, fig. 1*).—The author states that the fungus constantly associated with the lesions on the pedicels of the English Morello cherry did not prove to be the causal agent of the condition described as "small cherry." The fungus, which has been identified as *Coniothyrium olivaceum*, is present as a saprophyte on the pedicels, fruit, and epidermis of the 1- and 2-year-old twigs. Orchard practice; seasonal conditions; mechanical, insect, or spray injury; and fungal and bacterial infection may influence the size of the fruit, but it is considered that the data obtained definitely show that the pedicel injury, and the subsequent dropping and dwarfing of the fruit, should be attributed to acid lead arsenate. The injury was associated with lead arsenate when combined with Bordeaux mixture, lime sulfur, wettable sulfur, or sulfur dust, the least injury being noted where light applications of the last two fungicides were made.

Applications of lead arsenate also caused injury to various varieties of prunes similar to that produced on the English Morello cherry.

Silver-leaf disease of fruit trees, F. T. BROOKS (*Jour. Min. Agr. [Gt. Brit.], 31 (1925), No. 10, pp. 954–957*).—Victoria and Czar plums, two of the best varieties as regards quality and cropping capacity, are particularly susceptible to wilt. Such varieties as Early Rivers, Pershore, Greengage, Purple Egg, and Monarch are comparatively rarely attacked.

Progress report on red plant of strawberries, A. H. LEES and L. N. STANILAND (*Jour. Bath and West and South. Counties Soc., 5. ser., 19 (1924–25), pp. 196–199*).—Referring to the fact that Ballard and Peren in the report of the previous year (E. S. R., 52, p. 748) had accepted the presence and activity of *Aphelenchus fragariae* as causal in strawberry red plant, the present authors give an account of studies testing that view. The results are considered as justifying retention of that hypothesis for the present at least, but also as indicating the necessity of studies of the place of infection (leaf base or growing point), amount of dose, and state of the plant.

Vine black spot and erinose, F. DE CASTELLA (*Jour. Dept. Agr. Victoria, 23 (1925), No. 7, pp. 432–435*).—Vine black spot and erinose are among the few vine diseases which are amenable to winter treatment. The first of these has recently threatened to become disastrously prevalent, and the second has increased to an alarming extent.

For black spot (anthracnose, due to *Manginia ampelina*), the modified wash (iron sulfate 20 lbs., sulfuric acid 8 lbs., and hot water 10 gal.) seems to be of ample strength, if supplemented where needful by copper sprays. The so-called erinose disease is due to an acarian (*Phytoptus vitis*), for which the winter treatment above indicated is effective, destroying the hibernating mites.

Spraying experiments for downy mildew, H. G. WHITE (*Agr. Gaz. N. S. Wales, 35 (1924), No. 2, p. 94*).—Experiments in spraying for control of downy mildew were carried out at the Narara Viticultural Nursery during the season of

1923, which was very dry, the outbreak occurring late and in mild form. The applications included Bordeaux mixture at 6-4-40, 6-4-50, and 10-5-50; also at 6-4-40 with casein as a spreader (1 oz. to 10 gal.), and at the same strength with fish oil as a spreader (1 pt. to 25 gal.). A proprietary Bordeaux mixture and a proprietary Burgundy mixture were also used. These applications were made December 29, January 31, February 21, March 7, and April 4. All checked equally well the downy mildew present. The spreaders were satisfactory.

A disease of fig [trans. title], C. GHIBLANDA (*Ann. R. Accad. Agr. Torino, 67 (1924), pp. 71-76, figs. 2*).—A fruit fall of figs in Turin was found to be associated with the fungus *Alternaria fici*, formerly described technically by Farneti (E. S. R., 16, p. 987) as causing a fig fruit disease.

Bunchy top—what it is, how to detect it, what to do (*Queensland Agr. Jour., 25 (1926), No. 3, pp. 259-268, figs. 9*).—This article, written for the guidance of banana growers by the Bunchy Top Investigation Committee, outlines facts known regarding the bunchy top disease, its early detection, and approved protective measures. The disease is not caused, but is carried, by the banana aphis, becoming evident about a month after its transmission. Once transmitted it spreads to all plants or suckers in the stool affected. Specific directions are given.

The cause of citrus scab, E. M. DOIDGE and E. J. BUTLER (*Brit. Mycol. Soc. Trans., 10 (1924), pt. 1-2, pp. 119-121, fig. 1*).—Citrus scab or verrucosis, formerly ascribed to the fungus *Cladosporium citri*, but in 1923 attributed by Winston (E. S. R., 48, p. 647) to another fungus not named, is dealt with briefly by the present authors, who technically describe the fungus as a new species, which is named *Sporotrichum citri*.

Black spot on dried orange peel from China, W. A. BIRMINGHAM (*Agr. Gaz. N. S. Wales, 35 (1924), No. 5, p. 345*).—Record is made of citrus fruit black spot caused by *Phoma citricarpa* in China.

Cool storage of Washington Navel oranges, J. E. HARRISON (*Jour. Dept. Agr. Victoria, 23 (1925), No. 7, pp. 428-432*).—The year's experimentation emphasizes the points that fruits from different districts differ as regards keeping quality, that sweating best minimizes mold outbreak in cool storage of Washington Navel oranges, that an average temperature of 32° F. causes danger of freezing, and that 34° is the most satisfactory storage temperature.

Coffee root disease [trans. title], A. STEINMANN (*Arch. Koffie Cult. Nederland. Indië, 1 (1925), No. 1, pp. 79-81, pls. 2*).—Brief discussion is given regarding a coffee root disease associated with what is considered as a new fungus, *Polyporus rubidus*.

A note on branch-canker of tea, C. H. GADD (*Ceylon Dept. Agr. Yearbook 1926, pp. 7, 8, pl. 1*).—Tea branch canker in Ceylon is caused by *Corticium salmonicolor* and *Macrophoma theicola*. These are described, as are the protective measures found to be locally indispensable, which include a waterproof antiseptic covering, as tar, for all wounds. A Bordeaux spray may also be necessary.

A leaf disease of tea caused by Macrophoma theicola Petch, C. H. GADD and C. RAGUNATHAN (*Ceylon Dept. Agr. Yearbook 1926, pp. 16-18, pl. 1*).—In 1924, a tea branch disease in the Ragalla district was studied. This is ascribed to *M. theicola*, apparently here a wound parasite, at least so far as leaves are concerned. Its action on the tea stem varies with conditions, bark of young shoots up to 1 cm. in diameter being attacked. Natural causes may arrest the canker after elongated oval patches of the bark have been killed; or shedding of the bark may be followed by a branch canker and eventually by a dieback.

Cultures made from branches showing cankers in April, 1925, developed the same disease on wounded but not on unwounded tea leaves.

A die-back disease of dadap (Erythrina lithosperma), M. PARK (*Ceylon Dept. Agr. Yearbook 1926, pp. 9–12, pls. 2*).—In the Badulla district early in 1924 a disease of dadap (*E. lithosperma*) was noted, and later sporadic appearances were observed elsewhere. The symptoms are described. Experimentation showed that a Fusarium which has been isolated can cause the disease, though it probably enters by way of wounds, results suggesting that the infection more often enters through cut ends of branches of lopped trees and that damp atmospheric conditions are necessary to a serious outbreak. Apparently where growth conditions are particularly favorable to dadap, the disease tends to be mild. The disease is serious chiefly at those elevations at which it is difficult to establish the host. Pruning back to healthy tissue, tarring cut ends, and burning cut branches reduce the likelihood or amount of infection by air-borne spores.

[Pecan] disease control, G. H. BLACKMON (*Florida Sta. Rpt. 1926, pp. 65, 66*).—Spraying experiments with Bordeaux mixture and lime sulfur with various spreaders and stickers showed that while all the materials used gave fairly good results, the calcium caseinate caused the Bordeaux mixture to adhere to the foliage, nuts, and branches for a longer period than any of the other fungicides used, and no detrimental effects were experienced in using any of them. A portion of the trees sprayed had been top-worked to other varieties, and excellent results were obtained in controlling scab to permit the nuts to develop and mature to normal size, while on the unsprayed trees they scabbed so badly that practically all of them shed before maturity. Several dusts were used experimentally for the control of pecan scab, but no definite results are reported.

A disease of narcissus bulbs caused by a sclerotium-producing fungus N. L. ALCOCK (*Brit. Mycol. Soc. Trans., 10 (1924), pt. 1–2, pp. 127, 128*).—In 1922, narcissus bulbs examined showed white mycelium and black sclerotia, the fungus, as isolated and studied, recalling in some ways *Sclerotium oryzae*.

Hevea mildew, C. H. GADD (*Ceylon Dept. Agr. Yearbook 1926, pp. 22, 23*).—A study in 1925 of a Hevea leaf cast involving chiefly the young leaves, which are attacked just as they are expanding from the bud, showed the presence and presumed agency of an Oidium. This is said to attack also the flowers, and is also said here to be itself parasitized by a Cicinnobolus. The Hevea disease may be identical with Hevea mildew as known in Java, it is said, since 1918. Other plants, it is suspected, may harbor this Oidium locally in dry weather, which is not favorable to its development on Hevea.

A preliminary note on a Phytophthora associated with patch canker of Hevea brasiliensis in Malaya, A. THOMPSON (*Malayan Agr. Jour., 13 (1925), No. 5, pp. 139–141*).—Patch canker of *H. brasiliensis* has been attributed to *P. faberi*, as the disease has been claimed to follow inoculation with that fungus; but, it is here stated, no investigation has so far as ascertained originally isolated *P. faberi* from Hevea patch canker. In November, 1924, the author succeeded in isolating a fungus from diseased Hevea bark, the symptoms of which in this one instance resembled somewhat those of claret-colored canker. The fungus is considered to be a Phytophthora with a zoospore-liberating method closely similar to that in Pythium. Other differences are noted. Successful preliminary inoculations on Hevea have been made, and the fungus has been recovered from the inoculated trees. From these inoculations it appears that the fungus, which is not identical with *Phytophthora faberi*, is the cause of the Hevea patch canker in Malaya. It is considered probable

that, in mixed cacao and Hevea areas where cacao is attacked by *P. faberi*, this fungus would be responsible for the canker in Hevea. Further work is indicated as necessary to settlement of questions raised.

A collar disease of rubber seedlings, A. SHARPLES (*Malayan Agr. Jour.*, *13* (*1925*), *No. 6*, *pp. 150–153*).—The author calls attention to a disease of rubber basket seedlings in Malaya, also to observation on study by others of similar occurences on rubber or other plants elsewhere. The prominent fungus in both cases observed by the author was the common Diplodia said to be responsible for a rubber branch die-back. The stems of seedlings 9 to 12 in. high were attacked at or near the ground level, finally causing collapse of the plantlet. Comparisons are outlined, showing differences.

Spraying with 5 per cent Izal killed all badly infected plants, but no healthy plants, the treatment thus being entirely successful. It is thought that 2.5 per cent Izal would be sufficient and preferable.

Visual determination of penetration of sodium fluoride in treated wood, G. T. PARKER and H. A. GEAUQUE (*Amer. Wood Preservers' Assoc. Proc.*, *20* (*1924*), *pp. 20–26*).—An effective method is described of determining visually the limits of the portions which have been reached with the effective fungicidal sodium fluoride treatment in woods of such widely divergent qualities as pine, oak, and fir. Sharp and permanent tests are obtained in timber of any type, this statement including expressly woods having high tannin content. The color contrast is sharp and permanent to the dividing lines. The test is easy to make and inexpensive.

The comparative resistance of 17 species of wood-destroying fungi to sodium fluoride, C. A. RICHARDS (*Amer. Wood Preservers' Assoc. Proc.*, *20* (*1924*), *pp. 37–44*, *figs. 2*).—*Lenzites trabea* is the most resistant and *Poria incrassata* the least resistant of the fungi tested to sodium fluoride. The relative resistance of the fungi which were intermediate as regards resistance is shown in tabular form. These included *Polystictus abietinus*, *Lentinus lepideus*, *P. versicolor*, *Stereum fasciatum*, *Fomes roseus*, *F. pinicola*, *Trametes carnea*, *Lenzites sepiaria*, *P. hirsutus*, *Polyporus schweinitzii*, *T. pini abietis*, *F. annosus*, *L. striata*, *Schizophyllum commune*, and *Pleurotus ostreatus*.

The comparative resistance of eighteen species of wood-destroying fungi to zinc chloride, C. A. RICHARDS (*Amer. Wood Preservers' Assoc. Proc.*, *21* (*1925*), *pp. 18–22*).—Tests with zinc chloride and the same fungi as in the work with sodium fluoride noted above are reported, and the results obtained by the two salts, to which most of the fungi react in ways quite different, are compared.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The wild animals of Australasia, A. S. LE SOUEF and H. BURRELL (*London and Sydney: George G. Harrap & Co.*, *1926*, *pp. 388*, [*pls. 61*], *figs.* [8]).—In this work, following the introduction, an account is given by E. Le G. Troughton on The Bats of Australia and New Guinea (pp. 21–88). This is followed by accounts by the authors of wild dogs (pp. 89–93), seals (pp. 94–102), sea cows (pp. 103, 104), rats and mice (pp. 105–165), pouched animals or marsupials (pp. 166–369), and egg-laying mammals or monotremes (pp. 370–380). In all about 400 species of mammals belonging to these 7 distinct groups are known to occur in Australasia to-day.

The yellow ground squirrel of Turkestan, Cynomys fulvus oxianus Thomas, D. KASHKAROV and L. LEIN (*Ecology*, *8* (*1927*), *No. 1*, *pp. 63–72*, *figs. 3*).—This is a contribution from the state university at Tashkent, Turkestan.

Ecology of the red squirrel, A. B. KLUGH (*Jour. Mammal., 8 (1927), No. 1, pp. 1–32, pls. 5*).—A report of studies of *Sciurus hudsonicus* and subspecies.

An evaporation cup useful for chemotropic studies of insects in the field, A. PETERSON (*Jour. Econ. Ent., 19 (1926), No. 6, pp. 863–866, fig. 1*).—The author describes a small evaporation cup capable of holding aromatic chemicals which he has found to be useful in making studies of insect chemotropism under field conditions when liquid traps are employed.

A good type of cage for rearing parasites, S. KELER (*Jour. Econ. Ent., 19 (1926), No. 6, pp. 866, 867, pl. 1*).—The author describes a cage which he found useful while working in Poland on the bionomics of *Pimpla nucum* Rtz.

The effect of moisture, temperature, and light on the decomposition of lead arsenate in sulfur-lime dry mix spray, J. M. GINSBURG (*Jour. Econ. Ent., 19 (1926), No. 6, pp. 841–853*).—In this contribution from the New Jersey Experiment Stations it is reported that large amounts of water soluble arsenic are liberated when sulfur-lime dry mix spray containing acid lead arsenate is exposed to the atmosphere in thin layers on glass plates, being brought about by the calcium carbonate formed from the hydrated lime. Still greater percentages of soluble arsenic are formed when the $Ca(OH)_2$ is entirely replaced by $CaCO_3$. Apparently high humidity, intense sunlight, and a temperature of 110° F., singly or combined, do not play any significant rôle in decomposing the $PbHAsO_4$ but may cause arsenical injury to foliage indirectly by increasing the permeability of plant tissue to water soluble arsenic. A list of references to the literature is included.

Notes on some of the newer spray materials, W. C. DUTTON (*Michigan Sta. Quart. Bul., 9 (1927), No. 3, pp. 117–120*).—The author here points out the advantages and disadvantages of some of the newer spray materials, indicating the conditions under which they may be safely used. The materials considered include dry lime sulfur, other sulfur sprays, dry-mix sulfur-lime spray and wettable sulfur, casein spreader dusts, miscible oils and oil emulsions, and calcium arsenate.

Trials of tar-distillate washes in the West Midlands, S. G. JARY (*Jour. Min. Agr. [Gt. Brit.], 33 (1926), No. 8, pp. 753–761*).—Of the washes given 2-year tests those known as Mortegg and Carbokrimp were found the most effective. The eggs of aphids, apple suckers, and, to some extent, winter moths and tortricids are killed by these washes at 4 and 8 per cent strengths, but a concentration of 10 per cent is considered most effective and is also far more deadly against capsid eggs. In no case did any damage occur to buds sprayed with a 10 per cent strength, providing they were dormant at the time of application.

The toxic values of certain fluorides, S. MARCOVITCH (*Jour. Econ. Ent., 19 (1926), No. 5, pp. 795, 796*).—This is a contribution from the Tennessee Experiment Station, on which the author is led to conclude that for insecticidal purposes the fluosilicates (1) are more effective than relatively insoluble fluorides, (2) kill more rapidly than do the fluorides, (3) are readily obtained in commercial quantities whereas the relatively insoluble fluorides are not in a form suitable for dusting, and (4) are cheaper than the fluorides.

Report of the entomologist, C. P. GILLETTE (*Colorado Sta. Rpt. 1926, pp. 30–32*).—This is a brief statement of the occurrence of several of the more important insects of the year and control work conducted. The rose chafer became for the first time of economic importance in the State, particularly in the vicinity of Pueblo. The alfalfa weevil was discovered for the first time in portions of Routt, Rio Blanco, and Ouray Counties, this apparently having been an extension of the infested area in southwestern Wyoming and not a spread of the insect from the infested areas in western Colorado.

Investigations of the codling moth were continued by W. Yetter, Jr., in Mesa County and J. H. Newton in Delta County. While its control with sprays has been very successful with arsenate of lead in Delta County, an additional brood that occurs in Mesa County renders its control more difficult there, but the trapping of moths gives promise of being a valuable supplementary control measure.

Brief reference is made to grasshopper control work under the direction of G. Langford, outbreaks of which pest during the year were below the average.

Report of the entomologist, J. R. WATSON (*Florida Sta. Rpt. 1926, pp. 42–50*).—In reporting briefly upon the status of the citrus aphid (*Aphis spiraecola* Patch), the author records the rearing and liberation in groves of the Chinese ladybeetle (*Leis* sp.) received from California and its recovery the following year. It was found that heavy, dashing rains are very destructive to the aphids. Finely ground tobacco (snuff) was found to be one of the most promising insecticides for controlling this pest. Extensive tests in the fumigation of citrus trees with calcium cyanide dust conducted from September to March and again in May and June indicate that this method can be used any time of the year when spraying with oil emulsions is practicable, in sunlight as well as at night and under any ordinary weather conditions except when the trees are wet.

Life history notes on the citrus aphid by A. N. Tissot, based on observations at Gainesville, are presented (pp. 46–48), the details being given in tabular form. A temperature of 25° F. was found to kill some of the aphids outright, and a great many more were destroyed indirectly by the freezing of the tender growth upon which they were feeding. The observations seem to indicate that the most favorable temperature conditions for the development of the aphid are average daily maximum temperatures of 80 to 85° and average daily minimum temperatures of 60° or above. When the maximum temperature is above 90° for a few days there seems to be a slowing up in the rate of growth of the aphid and also a decrease in the daily and total number of nymphs produced. Likewise, development seems to be retarded when the average minimum temperature is below 50° for a few days. The apple and cherry laurel are added to the previously recorded food plants of this aphid.

Fumigation with calcium cyanide dust resulted in the killing of about 95 per cent of white fly larvae and purple scale and 96 per cent of the Florida red scale. The experience of the year indicates that fumigation will control rust mites for two or three months.

Observations of the Florida flower thrips (*Frankliniella tritici bispinosa* Morg.) show it to be common on almost any tender succulent growth, the young and tender shoots of the cherry laurel being a favored breeding ground.

Reference is made to control work with the bean leafhopper (*Empoasca fabae*), in which a hood was devised and found effective by Beyer, as described in Bulletin 164, previously noted (E. S. R., 47, p. 758).

Reference is made to work with pecan insects by H. E. Bartley. Case-bearers proved to be by far the most destructive insects to the pecan, the nut case-bearer being the worst enemy followed closely by the leaf case-bearer.

Entomology (*Iowa Sta. Rpt. 1926, pp. 39–43*).—This is a brief account of the occurrence of and control work with some of the more important insects of the year.

Myzus houghtonensis Troop was found to be a source of injury to the gooseberry during the summer of 1925. The carrot weevil (*Listronotus rudipennis* Blatch.) was a source of injury in several localities, due to the tunneling of

the carrots by the larvae, often causing a loss of from 50 to 90 per cent of the crop.

Reference is made to honeyflow conditions during the year and activities of individual bees by means of a method devised for determining the character of the contents of the honey sac without injury to the bee. It was found that nectar carriers required on the average from one-half to three-quarters of an hour to make a round trip, while water carriers, obtaining their loads within 50 yds. of the apiary, completed their round trips within an average of five minutes. In a study of protection for bees it was found that in Iowa they need protection in the fall equally as much as during the winter, and that during the spring they need it more than in winter by 50 per cent.

Injurious insects and other pests (*Kansas Sta. Bien. Rpt. 1925–26, pp. 71–84*).—This is a brief report of some of the more important features of the entomological work of the two years. Reference is made to climate and injurious insect investigations, the Hessian fly and other wheat insects, corn ear worm and other insects injurious to corn, the control of fruit and vegetable insects, control of insects attacking the sorghums, insects attacking the roots of staple crops, insects injurious to alfalfa and allied plants, shade tree insects, and investigations in the control of injurious rodents.

[**Contributions on economic insects**] (*Ztschr. Angew. Ent., 11 (1925), No. 3, pp. 325–458, figs. 33; 12 (1926), No. 1, pp. 1–184, pl. 1, figs. 34*).—Papers here presented (E. S. R., 55, p. 854) include the following in No. 3: The Coffee Berry Beetle Borer in the Dutch East Indies, by K. Friederichs (pp. 325–385), which includes a bibliography of 108 titles; The Introduction of the Woolly Apple Aphid Parasite *Aphelinum mali* (Hald.) into Germany, by R. Schander and O. Kaufmann (pp. 386–394); A Contribution on the Action of Arsenical Compounds on Lepidoptera, by W. Speyer (pp. 395–399); A Survey of Insect Enemies of Agriculture in Brazil, by K. Guenther (pp. 400–414); A Survey of the Insects of Agricultural Importance in Rio Grande do Sul, Brazil, by J. Wille (pp. 415–426), 265 being listed; The Coccid Fauna of Baden, by H. Wünn (pp. 427–451); A New Method of Combating Migratory Grasshoppers in Bulgaria, by A. K. Drenowski (pp. 452–455); and On the Winter Quarters of Cerambycid Beetles of the genus Rhagium, by M. Dingler (pp. 455–458).

The papers presented in No. 1 are as follows: The Use of Arsenicals in Plant Protection in Germany; A Retrospect and Prospect with the Aid of the Experience in Other Countries, by F. Stellwaag (pp. 1–49); The Pine Geometrid (Spanworm) in Bavaria in 1925, with Particular Reference to the Problem of Parasites, by H. Eidmann (pp. 51–90), including a bibliography of 23 titles; On the Prediction of the Number of Generations in Insects.—III, The Significance of Climate for Agricultural Entomology, by F. S. Bodenheimer (pp. 91–122), including a bibliography of 58 titles; On the Periodicity of the May Beetle—A Preliminary Note, by F. Zweigelt (pp. 123–137); Biology of *Angitia fenestralis* Holmgr. (Hymenoptera, Ichneumonidae), a Parasite of *Plutella maculipennis* Curt, and Notes on Immunity in Insects, by N. F. Meyer (pp. 139–152), including a bibliography of 14 titles; Weevil Studies.—II, New Contributions on the Generations of *Hylobius abietis* L., by M. Dingler (pp. 153–161); and Contributions to the Knowledge of an Amebic Disease of the Honey Bee (due to the organism *Vahlkampfia* (*Malpighamoeba*) *mellificae* n. sp.), by H. Prell (pp. 163–168), which includes a bibliography of 9 titles. A German translation is given of an address[a] by L. O. Howard on The Needs of the World as to Entomology (pp. 169–184).

[a] Ann. Ent. Soc. Amer., 18 (1925), No. 1, pp. 1–21.

A preliminary list of food-plants of some Malayan insects, B. A. R. GATER and G. H. CORBETT (*Fed. Malay States Dept. Agr. Bul. 38 (1926), pp. XVII+95*).—Following a brief preface and introduction with economic notes, the authors present a classified list of insects with their food-plants (pp. 1–26), then a classified list of the food-plants and the insects attacking them (pp. 27–85) and a list of miscellaneous foods (pp. 86–88). A list of 32 references and an index to the subject matter are included.

Insects injurious to the household and annoying to man, G. W. HERRICK (*New York: Macmillan Co., 1926, rev. ed., pp. XVII+478, pls. 8, figs. 152*).—This is a revised edition of the work previously noted (E. S. R., 32, p. 449).

Fighting locusts with a contact insecticide, C. H. GABLE (*Jour. Econ. Ent., 19 (1926), No. 6, pp. 861–863*).—This is a contribution from the U. S. D. A. Bureau of Entomology in which the author reports observations made during an outbreak of one of the "bird grasshoppers," or larger obscure locust (*Schistocerca obscura* Fab.), at Pleasanton, 30 miles south of San Antonio, Tex.

It is pointed out that, unlike the common injurious grasshopper, individuals of this species seldom touch the ground after they develop wings, congregating in the tops of trees and brush along the edges of the field, and fly in to feed about 8 or 9 o'clock in the morning. The observation that 90 per cent of the grasshoppers left the field at night and roosted on a strip of trees and brush 50 ft. wide led to the use of a contact spray. A cattle dip composed of total water-soluble arsenic 15.14 per cent, actual arsenious oxide (As_2O_3) 20.02 per cent, water 44.40 per cent, and equal parts of soft soap and sodium cresolate 20.44 per cent, with the strength of 1 part to 80 parts water killed 85 per cent of the pest and saved the entire crop of cotton. The spray mixture was applied with a barrel sprayer with 25 ft. of hose equipped with a Bordeaux nozzle, reaching the tops of the highest trees in the entire strip of infested brush.

The Thysanoptera of Europe, H. PRIESNER (*Die Thysanopteren Europas. Vienna: Fritz Wagner, 1926, pts. 1, pp. 238, pls. 3, figs. 2; 2, pp. 239–342, pl. 1*).—Following a brief introduction and an account of technique, this first part deals with the general morphology and anatomy of the Thysanoptera (pp. 12–64), observations of the morphology of the immature stages and metamorphosis (pp. 64–72), phylogeny (pp. 72–78), and special morphology and classification (pp. 78–238), with tables for the separation of the families, followed by a consideration of the suborder Terebrantia, including the superfamilies Aeolothripoidea (pp. 84–116) and Thripoidea. Part 2 is a continuation of the Thripoidea.

Cotton hopper control, H. G. GOOD (*Jour. Econ. Ent., 19 (1926), No. 6, pp. 869, 870*).—The author reports briefly on the results of dusting with S-dusting mixture in controlling the cotton hopper at the Alabama Experiment Station. This mixture is composed of 50 per cent sulfur and 50 per cent calcium cyanide, the cyanide content being between 17 and 25 per cent. It was found that this mixture was a good control medium for the cotton flea hopper, 8 to 10 lbs. per acre applied once a week being most satisfactory, and that no burning of foliage resulted from its application.

Determining the effectiveness of dormant treatments against the San Jose scale, W. S. ABBOTT (*Jour. Econ. Ent., 19 (1926), No. 6, pp. 858–860*).—The author concludes that a count of the first-generation young settling on new wood furnishes a reliable index of the effectiveness of dormant treatments against the San Jose scale. A comparison of these counts will show the relative efficiency of various treatments. A high negative correlation between this count and the percentage of hibernating scales found dead indicates the re-

liability of the latter count. The correlation coefficients indicate that in these experiments the records taken 30 days after treatment were accurate.

Life history studies of seven described species of the genus Lachnus, M. A. PALMER (*Ann. Ent. Soc. Amer., 19 (1926), No. 3, pp. 300–330, pls. 6*).—Five of the seven species of Lachnus here described have been reared from the egg through successive generations to the summer forms. Sexual forms of all, except *L. pseudotsugae*, have been reared from summer forms captured in nature and cared for in the insectary.

Dry-season studies of cane Homoptera at Soledad, Cuba, with a list of the coccids of the district, J. G. MYERS (*Harvard Inst. Trop. Biol. and Med. Contrib. 3 (1926), pp. 63–110, fig. 1*).—Following a brief introduction, the author presents a summary of present knowledge of insect transmission of mosaic of cane, the mosaic situation at Soledad, the feeding habits of Hemiptera in general, and the cane Homoptera of Soledad, followed by a general summary and conclusions. A description of *Phaciocephalus cubanus* n. sp., taken from sugar cane at Soledad, is given in the first appendix, and a list of coccids of Soledad and their host plants in the second appendix. A bibliography of three pages is included.

A contribution to the study of the biology and classification of the Coccidae [trans. title], P. VAYSSIÈRE (*Min. Agr. [France], Ann. Épiphyties, 12 (1926), No. 4–5, pp. 197–382, pls. 6, figs. 95*).—The first part of this work (pp. 202–347), following a brief introduction, deals with the subfamily Monophlebinae, treating of its general characteristics (pp. 202–213), a biological study of a monophlebine, *Guerinia serratulae* Fab. (pp. 214–256), and the classification of the subfamily Monophlebinae, with descriptions of new species (pp. 256–347). The second part (pp. 348–376) deals with the coccids from the standpoint of biogeography, including hosts, distribution of coccids on their hosts, geographical distribution of coccids, and various methods of dispersion of coccids. A bibliography of five pages is included.

Report on sugar-cane borers at Soledad, Cuba, G. SALT (*Harvard Inst. Trop. Biol. and Med. Contrib. 3 (1926), pp. 9–62, pls. 4, figs. 2*).—This account is based upon 10 weeks' study of borers at Soledad, Cuba, particularly the sugarcane borer, the silky cane weevil, and the shot-hole borer *Xyleborus* sp. A list of parasites and predators of Diatraea is presented in the first appendix and a list of ants inhabiting Diatraea borings in sugar cane in the second appendix. A bibliography of four pages is included.

The maize-stalk borer (Busseola fusca, Fuller), R. O. WAHL (*Farming in So. Africa, 1 (1926), No. 8, pp. 279–281, 282, figs. 3*).—This is an illustrated summary of information on an important enemy of the corn crop in South Africa and means for its control.

Apple leaf-rollers of the genera Amorbia, Archips, Eulia, Pandemis, and Peronea, S. W. FROST (*Jour. Econ. Ent., 19 (1926), No. 6, pp. 813–819, fig. 1*).—This is said to be an introductory paper to a more complete and detailed study of economic leaf-rollers. The author summarizes numerous scattered life-history studies, comparing them as to range of food plants, number of broods, manner of hibernation, and other minor habits. Many original notes are included.

Codling moth in the Arkansas Valley, W. R. MARTIN (*Kans. State Hort. Soc. Bien. Rpt., 38 (1924–25), pp. 51–56*).—The author reports that, beginning with 1922 and continuing up to the time of writing, the codling moth has increased very rapidly in the Arkansas Valley in Kansas, and that about 75 per cent of the crops of both 1923 and 1924 showed codling moth injury. In 1925 from 15 to 20 per cent of the fruit was wormy and from 50 to 70 per

cent of the remainder was stung. The investigations conducted in 1925 showed other factors than the proper timing of the sprays to be necessary for satisfactory control. These factors include materials used, population of moths, set of fruit, and injury of the fruit. A chart is presented which graphically illustrates the emergence of the codling moth and the application of sprays in 1924.

A test made of the efficiency of commercial spreaders in control of codling moth and apple blotch indicates that the oil spreaders were slightly more efficient, but that neither the oil nor the casein showed enough improvement over the check to warrant its general use. It is pointed out that the population of codling moth depends upon 4 factors, namely, winter mortality, packing sheds, natural enemies, and crop failures. The table presented shows the effect of light and heavy crops of apples on different trees in the same orchard in regard to codling moth control.

Oriental fruit moth invades Ohio, D. M. DeLong (*Agr. Student, 33 (1927), No. 5, pp. 117–119, 137, 138, figs. 3*).—A brief account of this pest, which was first found in Ohio at Columbus in the summer of 1925, when fruit on some trees under observation was found infested to the extent of 5 to 10 per cent.

The European corn borer Pyrausta nubilalis Hubn.—I, A discussion of its dormant period, K. W. Babcock (*Ecology, 8 (1927), No. 1, pp. 45–59*).—This account is based upon investigations, details of which are given in tabular form.

The author finds that after a certain period of development the intervention of a dormant or rest period is essential for the general welfare of the species. The inception of dormancy in the corn borer is not initiated by a fall in temperature, nor does heat alone at certain times during this period cause it to emerge from this state and resume development. The larva is very sensitive to changes in contact moisture during the dormant period. If desiccation occurs at this time, retardation of pupation results, and if the loss of moisture is not compensated for before active development begins, the number of one-generation individuals present in the descendants tends to increase.

The moth that destroys our fruit, C. P. van der Merwe (*Farming in So. Africa, 1 (1926), No. 2, p. 53*).—An account of the *Achaea lienardi*, which attacks and injures fruit that is ripe or nearly ripe.

The relation of the red-backed cutworm to diversified agriculture in western Canada, K. M. King and N. J. Atkinson (*Sci. Agr., 7 (1926), No. 3, pp. 86–91, fig. 1*).—In this discussion it is pointed out that the damage caused by *Euxoa ochrogaster* Gn. (E. S. R., 55, p. 855) depresses the growing of those crops which it is most desirable to introduce in the Prairie Provinces in an effort to promote diversified agriculture, and exerts a strong pressure tending toward a continuance of the straight grain farming now practiced. The principal crops which it is desired to introduce are sweet clover, alfalfa, flax, corn, and sunflowers. These suffer more severely than grain because they are preferred to cereals by the cutworm, if cut while young they have no powers of recovery, and the seedlings, at least of the first three mentioned, are very small.

The cheese skipper as a pest in cured meats, P. Simmons (*U. S. Dept. Agr. Bul. 1453 (1927), pp. 56, pl. 1, figs. 10*).—This is a summary of information on *Piophila casei* (L.), based upon a review of the literature in connection with a bibliography of 83 titles and investigations conducted by the author. The subject is presented under the headings of systematic position and synonymy, common names, distribution, materials infested, the cheese skipper and disease, nature of injury to cured meat, the adult insect, the egg, the larva, metamorphosis, emergence of adult, life cycle, insects found associated with the cheese

skipper, and control measures, of which the principal are preventing the adults from entering storage rooms and infesting the meats.

Syllabus of insect biology.—Coleoptera, I, H. Blunck (*Syllabus der Insektenbiologie. Coleopteren. Lieferung 1. Berlin: Borntraeger Bros., 1925, [No. 4a], pp. 136; rev. in Ent. News, 38 (1927), No. 1, pp. 28, 29*).—This first part of the author's syllabus includes the Coleoptera through Histeridae. In the preparation of this work an attempt is being made to record all that has been published upon the life histories of insects, group by group and species by species. The review is by L. O. Howard.

The parasites of Popillia japonica in Japan and Chosen (Korea) and their introduction into the United States, C. P. Clausen, J. L. King, and C. Teranishi (*U. S. Dept. Agr. Bul. 1429 (1927), pp. 56, pl. 1, figs. 35*).—This is a summary of information on investigations of parasites of the Japanese beetle initiated in Japan in the spring of 1920 at Yokohama and extended in 1922 to Chosen. The subject is dealt with under the special headings of the parasites and their biology (pp. 3–44), life history of *Popillia japonica* in Japan (pp. 44–47), food plants of Popillia in Japan (pp. 47, 48), climatic conditions in the main fields of investigation (pp. 48–51), agriculture and natural lands of Japan and Chosen in relation to Popillia (pp. 51–53), and the species of Popillia in Chosen, i. e., *P. atrocoerulea* Bates, *P. castanoptera* Hope, and *P. mutans* Newm. (pp. 53, 54).

The parasites and predator dealt with include the following: *Centeter cinerea* Aldrich, *Eutrixopsis javana* Towns., *Ochromeigenia ormioides* Towns., *Prosena siberita* (Fab.), *Dexia ventralis* Aldrich, *Campsomeris annulata* (Fab.), *Tiphia popilliavora* Roh., *T. vernalis* Roh., and *T. koreana* Roh., and the carabid predator *Craspedonotus tibialis* Schaum, representing three species of Tachinidae, two species of Dexiidae, and four species of Scoliidae. Among the tachinids *C. cinerea* is the most promising species, since in its native habitat it is very abundant and exerts a marked control upon *P. japonica*. *O. ormioides* is more common in the warmer regions in Japan, though it ranges into Chosen and northern China, which would indicate that it is not limited to mild climatic conditions. Of the Tiphia species, *T. popilliavora* at Koiwai effects a parasitism of 20 per cent upon grubs of *J. japonica*. It was found that in the Orient *P. japonica* occurs only in Japan proper, and in that country it is of very minor importance as an enemy of economic crops.

Sodium fluosilicate as a control for blister beetles on soybeans in southwestern Louisiana, J. W. Ingram (*Jour. Econ. Ent., 19 (1926), No. 6, pp. 853–858*).—This contribution from the U. S. D. A. Bureau of Entomology reports on experiments conducted in southwestern Louisiana for the control of blister beetles on soy beans. The details are given of the work conducted, a brief account of which has been previously noted (E. S. R., 55, p. 662).

The control of wireworms in glasshouses, H. W. Miles and F. R. Petherbridge (*Jour. Min. Agr. [Gt. Brit.], 33 (1926), No. 10, pp. 931–939*).—In the experiments reported calcium cyanide used at the rate of 1.5 to 3.5 lbs. per 180 cu. ft., in conjunction with a suitable method of baiting, gave a good control. The results indicate that the finer the soil the more effective the treatment, and the nearer the middle of the bait rows the calcium cyanide is deposited the higher the mortality among the wireworms.

Effect of highway slash on infestation by western pine beetle studied (*U. S. Dept. Agr., Public Roads, 7 (1927), No. 12, pp. 251, 252*).—This is a brief account of the results obtained in a 4-year investigation of the effect of slash from highway clearing on insect infestation of surrounding timber. The work was conducted by J. E. Patterson, of the U. S. D. A. Bureau of Entomology, on

a highway in the Cascade Mountains of southern Oregon. The study was commenced in 1920 with the clearing of a highway through a larger timber area consisting of yellow pine, sugar pine, Douglas fir, white fir, and true fir, the slash consisting of entire trunks and tops of trees dragged to either side of a clearing 60 ft. wide and 24 miles long.

The results obtained in this region, where the western pine beetle is the principal insect enemy of the mature western yellow pine, show that line slash is very attractive to it, practically all such slash being attacked by this bark beetle. Its attack on the slash was not so heavy, however, as on mature standing timber, about one-half as many beetles attacking a unit area of bark on the felled trees. Due to an abnormal mortality the increase of beetles developing in the slash studied was only 64 per cent of the number of beetles making the attack, whereas the corresponding increase in adjacent timber at the same time was 135 per cent. It was found that bark beetles from the surrounding standing timber were attracted to the slash at the time of attack, and a temporary concentration of infestation occurred in its immediate vicinity. However, normal distribution of the infestation was resumed within a year. This concentration and the breeding of beetles in line slash did not increase or greatly influence infestations in the surrounding forest, the cycle of infestation continuing regardless of the slash The study indicates that the infestation of line slash by *Dendroctonus brevicomis* is not a serious menace to neighboring mature timber, and may be disregarded when the problem of slash disposal is under consideration.

The western pine beetle control problem, J. M. MILLER (*Jour. Forestry, 24 (1926), No. 8, pp. 897–910*).—The problem of controlling the western pine beetle is considered under the headings of character of damage, basis for control methods and strategy, results of early control projects, importance of natural control factors, maintenance control, control of an isolated infestation, a million acre project (the southern Oregon—northern California), improved methods needed, possibility of control through forest management, and the need for further investigations.

Boll weevil investigations (*Florida Sta. Rpt. 1926, pp. 40, 41*).—In a study made by E. F. Grossman of a large number of mixtures, it was found that one consisting of 1 lb. of calcium arsenate, 1 gal. of water, and 1 gal. of sirup was the most effective in its resistance to rain, drying, and surface caking, as well as being cheaper than the more concentrated mixtures commonly recommended. A mixture consisting of 1 lb. of calcium arsenate, 2 gal. of water, and 1 gal. of sirup was also found to be very effective. The fact that the supernatant liquid obtained when these mixtures settled did not contain sufficient arsenic to be toxic to the weevils emphasizes the need for stirring these mixtures while using. Laboratory tests with weevils upheld the contention that blackstrap is much inferior to higher grade sirups for making sirup mixtures. In the experiments the weevils would actually refuse blackstrap and, in most cases, feed immediately upon higher grade sirups if offered.

The life history and control of the cranberry weevil, Anthonomus musculus Say (Coleoptera: Curculionidae), D. S. LACROIX (*Jour. Econ. Ent., 19 (1926), No. 6, pp. 819–829*).—This is a contribution from the Massachusetts Experiment Station dealing with a pest that occurs sporadically on Massachusetts bogs, often causing considerable loss to the cranberry crop before its presence is suspected. It is pointed out that the true cranberry weevil is *A. musculus* Say, not *A. suturalis* LeConte as it has been referred to in the past. It has a single generation a year in Massachusetts and both the larvae and the adults are of economic importance. Control measures carried out experimentally

resulted in the adoption of a mixture of Bordeaux, calcium arsenate, lime, and fish-oil soap. This insecticide has proved efficient when applied commercially. The Bordeaux and soap tend to spread the mixture evenly over the waxy cuticle of the cranberry leaf and fruit and to make it stick under severe conditions.

Bees, wasps, and ants, C. A. Hall (*London: A. & C. Black, 1925, pp. VIII+88, pls. 12, figs. 5*).—This is a popular account dealing with the social and solitary bees and wasps and the ants.

Bee investigations (*Kansas Sta. Bien. Rpt. 1925–26, pp. 117, 118*).—Particular mention is made of a study of the causes which affect the granulation of honey. The work indicates that (1) diffused light does not influence crystallization, (2) low temperatures combined with extreme variations in daily temperatures hasten the beginning of crystallization and also shorten the period of time (3) air incorporated into honey has a tendency to hasten the beginning of crystallization and shortens the period required, (4) crystallization of a blend of two or more honeys is influenced by the ratio of crystallization and shortens the period required, (5) crystallization of a blend of two or more honeys is influenced by the ratio of crystallization to noncrystallizable sugars which it contains, (6) a correlation exists between the percentage of dextrose in honey and the number of days from extraction until crystallization begins, and (7) a correlation exists between the percentage of dextrose in honey and the length of time required for the completion of the crystallization process.

The domestic bee, its care and product, L. Iches (*L'Abeille Domestique, son Élevage et ses Produits. Paris: Garnier Bros., [1925], pp. XXI+351, figs. 134*).—This is a practical account.

Telenomus cosmopeplae Gahan, an egg parasite of Cosmopepla bimaculata Thomas, W. V. Balduf (*Jour. Econ. Ent., 19 (1926), No. 6, pp. 829–841*).—It is pointed out that the pentatomid *C. bimaculata* Thomas is a potential pest of the snapdragon on which it is commonly found. It is held in check, however, by a new egg parasite, *T. cosmopeplae* Gahan. In the present paper the author reports upon the manner of oviposition, larval habits, life cycle, and economic value of the parasite. *Triphleps insidiosus* Say is suspected of reducing the effectiveness of the parasite by preying on the Cosmopepla eggs, both parasitized and unparasitized.

The anatomy of a British phytophagous chalcidoid of the genus Harmolita (Isosoma), H. C. James (*Zool. Soc. London Proc., 1926, I, pp. 75–182, figs. 70*).—This is a report of an extended anatomical study of the eurytomid *H. graminicola* (Giraud).

Notes on some feeding habits of two chalcid parasites, G. H. Griswold (*Ann. Ent. Soc. Amer., 19 (1926), No. 3, pp. 331–334, fig. 1*).—The author here adds *Aphidencyrtus inquisitor* Howard and *Aphelinus jucundus* Gahan, which were reared from the geranium aphid *Macrosiphum cornelli* Patch, to the increasing list of chalcids that have been observed feeding at puncture holes made by the ovipositor.

Insect control, G. H. Blackmon (*Florida Sta. Rpt. 1926, pp. 66, 67*).—The pecan culturist reports that in cooperative work with the department of entomology excellent results were obtained in control of the leaf-case bearer by the use of 1 lb. of arsenate of lead and 3 lbs. of lime to 50 gal. water, or by adding it to Bordeaux in the same proportion. Two applications, made about July and August, have a somewhat better control than did one.

The cultivation of Herpetomonas muscarum (Leidy 1856) Kent 1881 from Lucilia sericata, J. J. Drbohlav (*Jour. Parasitol., 12 (1926), No. 4, pp. 183–190, pls. 2; abs. in Jour. Trop. Med. and Hyg. [London], 29 (1926), No. 24,*

p. 412).—This herpetomonas, requiring a medium of low hydrogen-ion concentration, namely, pH 5.6 to 6.4, was isolated in pure live culture from the green-bottle fly, *L. sericata*. It was found in 83.4 per cent of the specimens examined.

ANIMAL PRODUCTION

The interpretation of the feeding trial, E. W. CRAMPTON (*Sci. Agr.*, 7 (*1926*), *No. 2, pp. 41–50*).—This article explains the application of biometry to the data of feeding trials for fattening and dairy animals. It also shows how biometry is used in the interpretation of these data.

Preliminary investigations regarding the influence of the size of the ration on the productive value of feeding stuffs [trans. title], I. POIJÄRVI (*Statens Lantbruksförsöksverks.* [*Finland*] *Vetensk. Pub. 6* (*1926*), *pp. 43, figs. 5; Eng. abs., pp. 38–41*).—This preliminary work indicates that as the bulk in the ration increases the digestibility decreases. Three reasons have been tentatively assigned for this reduction in digestibility; (1) increased bulk passes through the digestive tract quicker and hence has less time for digestion, (2) the bacterial action which aids in digesting crude fiber may be limited, and (3) there may be a limit to the capacity of the intestines to absorb digested nutrients.

Animal nutrition work [at the Iowa Station] (*Iowa Sta. Rpt. 1926, pp. 34, 35*).—The continuation of the study of the effect of mineral supplements (E. S. R., 55, p. 561) has dealt largely with the value of salts of fluorine. Successive generations of rats fed less than 0.025 per cent sodium fluoride apparently reproduced well but did not grow normally. Reproduction in this case is usually slow, the mortality high, and the weight of each successive generation is less. Calcium fluoride apparently has the same effect as sodium fluoride, but being less soluble rats can tolerate it in larger amounts. Rats tolerate both salts in larger amounts when fed with a mixed ration than when fed with a purified ration or a single grain ration.

Feeding beef cattle in California, H. R. GUILBERT (*Calif. Agr. Col. Ext. Circ. 3* (*1926*), *pp. 19, figs. 4*).—A popular discussion of the reasons, the methods, and the principles for feeding beef cattle in California.

Cattle feeding experiments (*Iowa Sta. Rpt. 1926, pp. 18, 19*).—Eight lots of 2-year-old steers were fed for 120 days to compare silage and hay, and dry roughage as the roughage portion of a ration and also the value of mineral supplements. Two commonly used Corn Belt rations were fed in this experiment: (1) Shelled corn, oil meal, alfalfa hay, and salt and (2) the same except that corn silage was added.

The results indicate that the above rations were of equal merit from the standpoint of gain and cost of gain. The addition of 1.25 oz. of a simple mineral mixture increased the rate of gain 5 per cent and raised the selling price from 15 to 25 cts. per hundredweight. Steers ate an average of 3.25 oz. of black loam per day. Black loam increased the daily gains, decreased the feed required for 100 lbs. of gain, and increased the selling price 50 cts. per 100 lbs. Corn fodder and alfalfa hay as the roughage portion of a ration was not successful either in rate or economy of gains.

Buying and feeding cattle, R. BERESFORD and C. W. MCDONALD (*Iowa Agr. Col. Ext. Bul. 117* (*1926*), *pp. 31, figs. 12*).—A popular presentation of the problems of buying and feeding beef cattle.

Beef-cattle feeding investigations [at the Fort Hays Substation] (*Kansas Sta. Bien. Rpt. 1925–26, pp. 139, 140*).—The results of experiments with kafir and cane in the form of dry roughage and in the form of silage have been previously noted (E. S. R., 55, p. 358). The calculated return per acre for

feeds consumed by lots receiving silage was $18.13 and where no silage was fed $5.18. Calves receiving 13.67 lbs. of alfalfa hay and 1 lb. of cottonseed cake per day gained 0.73 lb. daily, while calves fed the same ration except that Sudan hay was substituted for alfalfa gained 0.47 lb. daily. Cows fed on cut kafir or sorgo butts with alfalfa hay made somewhat larger gains than those fed whole kafir or sorgo butts. However, the difference was not great enough to pay for the cost of cutting.

Swine feeding experiments, J. M. Scott (*Florida Sta. Rpt. 1926, pp. 26–28*).—In three experiments of two lots each, in which 7, 10, and 7 hogs per lot, respectively, were fed to compare rations of (1) shelled corn 9 parts and fish meal 1 part and (2) shelled corn 9 parts, alfalfa meal 2 parts, and cottonseed meal 1 part, the pigs fed alfalfa meal and cottonseed meal made an average of 0.13 lb. per head greater daily gain than the lot fed fish meal. The feed requirement for 100 lbs. gain was less when fish meal was used.

[Swine feeding and breeding experiments at the Iowa Station] (*Iowa Sta. Rpt. 1926, pp. 20, 21, 22, 23*).—Results of two experiments not previously reported are briefly noted.

Hogging down corn to best advantage.—Seven lots of 15 120-lb. pigs were fed in different cornfields and compared with a check lot on rape pasture. Pigs receiving standing corn and minerals required 693 lbs. of feed to produce 100 lbs. of gain, while in a similar field in which soy beans were planted and tankage and minerals allowed the pigs required only 412 lbs. of feed to produce the same gain. The first lot made an average daily gain of 1 lb. per day, while those in the second lot made 1⅔ lbs. per day. Standing corn supplemented with whole soy beans, or tankage, or beans in the pod, or tankage and beans in the pod, or rape and tankage, or rye and tankage, gave better results than standing corn and minerals. Beans planted in the hills of corn reduced the yield of corn, and hence reduced the hog gains per acre. Beans as the sole supplement to corn are not satisfactory. Hogging down corn when properly managed has been much more economical than feeding the husked corn to pigs on rape pasture.

Swine inbreeding v. outbreeding.—A record of 11 outbred and 8 inbred litters showed that the inbred sows produced 8.0 pigs per litter, while the outbred sows produced 6.8 pigs. However, 36 per cent of the inbred pigs died before the end of the suckling period, while only 18 per cent of the outbred pigs died. Seven outbred litters required 220 days to reach 225 lbs. in weight, while 4 inbred litters required 249 days to reach the same weight.

[Investigations with swine at the Kansas Station] (*Kansas Sta. Bien. Rpt. 1925–26, pp. 84–86, 88–91, 92*).—The results of experiments are briefly noted.

The nutritive requirements of swine.—This is a continuation of work previously noted (E. S. R., 52, p. 469). A chemical analysis of the blood, bone, and brain of pigs fed a ration of white corn, tankage, and bone ash to an advanced stage of avitaminosis A showed no significant difference when compared with normal hogs. Of 4 sows fed an optimum ration of white corn, tankage, bone ash, alfalfa meal, sprouted oats, butterfat, and cod-liver oil, 2 farrowed good litters and 2 poor. Individuality of the animals seemed to play an important part in the production of this lot.

Swine feeding investigations.—During the winter of 1924–25 5 lots of 10 pigs each were fattened in dry lot on corn and a protein supplement which consisted of (1) tankage, (2) 3 parts tankage to 1 part linseed oil meal, (3) 2 parts tankage and 2 parts linseed oil meal, (4) 1 part tankage and 3 parts linseed oil meal, and (5) linseed oil meal. Alfalfa hay was fed to all lots. In this experiment it was found that the greater the proportion of tankage

and the less linseed oil meal in the ration the greater the gains and finish and the cheaper the gains.

Three lots of 15 pigs each were fattened during the summer of 1925 on alfalfa pasture, corn, and a protein supplement consisting of (1) tankage, (2) tankage 50 per cent and linseed oil meal 50 per cent, and (3) linseed oil meal. There was little difference in the rate or economy of gains in the first and second lots. In the third lot the feed required per unit of gain was about the same as in the other lots, but the rate of gain was 14 per cent less.

During the winter of 1925–26, 6 lots of 8 pigs each were fattened in dry lot on corn and the following supplements: (1) Tankage and salt, (2) tankage and alfalfa hay, (3) tankage, alfalfa hay, and salt, (4) equal parts of tankage and linseed oil meal, (5) equal parts of tankage and oil meal and alfalfa hay, and (6) equal parts of tankage and oil meal, alfalfa hay, and salt. The rate and economy of gains were greater in lots fed tankage. The use of alfalfa hay resulted in more vigorous and healthy pigs. The addition of salt to a ration containing alfalfa hay reduced the rate of gain and increased the feed required per unit of gain.

Pigs fed corn and tankage on alfalfa pasture made an average daily gain of 1.47 lbs. over a period of 105 days. Pigs fed ground kafir and tankage on Sudan pasture gained 1.37 lbs. daily. It required 341.42 lbs. of corn and 3.8 lbs. of tankage on alfalfa pasture and 354.44 lbs. of ground kafir and 17.52 lbs. of tankage on Sudan grass pasture to produce 100 lbs. of gain.

A comparison of different methods of feeding spring pigs.—A study was made of different methods of feeding spring pigs: (1) Deferred full feeding v. immediate full feeding, (2) growing feeder pigs on alfalfa pasture, and (3) fattening feeder pigs on new corn. One group of pigs fed 1 lb. of corn and 0.2 lb. of tankage on alfalfa pasture from June 15 to September 28 made an average daily gain of 0.53 lb. It required approximately 2 bu. of corn and 20 lbs. of tankage besides the alfalfa pasture to grow these pigs from 60 to 115 lbs. From September 28 these same pigs were fed an average of 8.24 lbs. of corn and 0.25 lb. of tankage for 60 days. During this period they averaged approximately 2.05 lbs. per head daily gain. It required 9 bu. of corn and 15 lbs. of tankage to increase the live weight from 115 to 238 lbs. The other lot full fed from the start made an average daily gain of 1.51 lbs. for a period of 105 days. These pigs ate an average of 4.96 lbs. of corn and 0.2 lb. of tankage and required about 9.5 bu. of corn and 20 lbs. of tankage to increase from 60 to 218 lbs. in weight.

A study of pasture values and pasture methods for horses, cattle, sheep, and swine.—In a study of pastures sweet clover proved to be less valuable than alfalfa for swine but satisfactory for sheep and cattle. Little trouble was experienced with bloat. Sudan grass proved to be one of the most satisfactory summer pasture crops for all classes of livestock. Orchard grass was one of the most satisfactory permanent pasture grasses.

[Irrigated pastures at the Garden City, Kans., Substation] (*Kansas Sta. Bien. Rpt. 1925–26, pp. 143, 144*).—Two lots of 50- to 60-lb. spring pigs were fed on irrigated alfalfa pasture for 108 days. One lot received 2 lbs. of ground milo per 100 lbs. live weight, and the other lot was self-fed ground milo. Lot 1 gained an average of 0.55 lb. per head daily, and lot 2 gained 1.2 lbs. It was found that the pigs in lot 2 were ready for market at the end of the grazing season, while those in lot 1 needed a finishing period in dry lot. The calculated return per acre of alfalfa was $75.37 less cost of milo in the case of lot 1, and $109.18 in the case of lot 2.

Two half-acre plats were seeded to a mixture of 9 varieties of tame grasses. A third plat was seeded to sweet clover. One of the grass plats was treated with barnyard manure. During 1925 the mixed grass plats furnished 143 days' pasture at the rate of 2 dairy cows per acre, and the sweet clover plat furnished 140 days' pasture at the same rate. The net return from the untreated grass plat was approximately $37.50, from the treated plat $51.75, and from the sweet clover plat $54.70.

Some experiments in mineral feeding, R. D. Sinclair and J. P. Sackville (*Sci. Agr., 6 (1926), No. 11, pp. 373–379, figs. 5*).—The results of two trials with the feeding of minerals to hogs on pasture are reported. The pigs in these experiments averaged from 45 to 55 lbs. in weight at the beginning of the trial. All lots were run on rape pasture, and the grain ration consisted of oats, barley, and shorts. Buttermilk was fed to all lots at the beginning of the test, but the amount was decreased until none was being fed at the end of 28 days. Where tankage was fed the amount given was 5 per cent of the grain ration.

In both trials the addition of a simple mineral mixture when tankage was not fed resulted in increased gains and lower feed requirements. Complex mineral mixtures were not as economical, either in rate of gain or feed required, as the simple mixtures.

Very good results were obtained in feeding salt as a supplement, indicating that sodium chloride is an essential ingredient to mineral mixtures. No ill effects from salt feeding were observed.

The addition of a simple mineral mixture to tankage did not indicate that tankage needed mineral supplements. In all tests the addition of the simple mineral mixtures to grain alone gave more rapid and more economical gains than when tankage was added.

The influence of different quantities of salt upon the palatability and keeping qualities of hams and bacon (*Kansas Sta. Bien. Rpt. 1925–26, pp. 92–94*).—During 1924–25, 5 lots of hams and bacons were put in cures in which the amount of salt varied. The formula used in lot 1 was 12 lbs. of salt, 3 lbs. of brown sugar, and 3 oz. of saltpeter dissolved in 6 gal. of water for each 100 lbs. of meat. The bacons were left in the cure for 2 days per pound per piece and the hams 3 days per pound per piece and then smoked for 24 hours with hickory smoke. In lots 2, 3, 4, and 5 the cure was the same except that the salt was reduced to 11, 10, 9, and 8 lbs., respectively. From the standpoint of palatability, the use of 9 and 10 lbs. of salt (70 to 76° by the salimometer) gave the best results. A chemical analysis of these two lots showed the salt content of the bacons to be 3.05 and 2.82 per cent and for the hams 4.45 and 4.68 per cent, respectively. The amount of salt used had no effect upon the development of molds. The sugar content was about 50 per cent less than that present in commercial products, and the saltpeter was also less. This was thought to be due to the calcium content of the salt and water.

In 1925–26 the cure used in lot 1 was the same as described above except that the time in smoke was reduced 4 hours. In lot 2, 10 lbs. of Kansas salt was used; in lot 3, 10 lbs. of Michigan salt; and in lot 4, 8 lbs. of Kansas salt. In lots 5 and 6 smoked salt was used as directed by the manufacturers, lot 5 using the dry cure and lot 6 the brine cure. Eight lbs. of salt (65° by the salimometer) was found to be satisfactory. The amount of salt had no apparent effect upon shrinkage. In palatability and physical appearance the Kansas salt produced the same results as Michigan salt. Smoked salt was fairly satisfactory, the meat shrinking less than when cured by the regular method, but being inferior as to color, flavor, and cooking qualities. The brine cure proved most efficient when smoked salt was used.

The Chow Chow, E. L. Dietrich and L. M. Davies (*Chicago: Judy Pub. Co., 1926, pp. 72, figs. 35*).—This book contains a brief history and suggestions on the management, feeding, and showing of the chow dog.

Operation of a four-unit poultry plant for commercial year 1925–1926, B. F. Kaupp (*North Carolina Sta. Bul. 251 (1927), pp. 28, figs. 7*).—Two years' results of a 10-year experiment are reported in this bulletin. It is a continuation and elaboration of work previously noted (E. S. R., 55, p. 265).

[Poultry investigations at the Kansas Station] (*Kansas Sta. Bien. Rpt. 1925–26, pp. 107–111, 123, 124, 125*).—The results of experiments are briefly noted.

Poultry flock management.—This is a continuation of work previously noted (E. S. R., 52, p. 474). High winter egg yields were gotten by placing March or April hatched pullets in the laying house October 1, confining them until April 15, and forcing for egg production during this period. Hens that have completed one or more years' production produce eggs of good fertility and hatchability when allowed free range all winter and spring.

Effect of feeding white and yellow corn and supplementary feeds on egg production and hatchability.—Ten Rhode Island Red pullets fed white corn and meat scrap produced an average of 50 eggs from November 1 to June 1 that were 82 per cent fertile, but only 38 per cent of these hatched. A similar lot fed yellow corn and meat scrap produced 89 eggs, 74 per cent of which were fertile, and 60 per cent of these hatched. With soy bean meal and 3 per cent mineral mixture added to the white corn ration, the number of eggs was larger by 8, but there was no effect upon fertility, and the hatchability was raised to 61 per cent. With white corn, meat scrap, and alfalfa meal the egg production was 77, the fertility 44 per cent, and the hatchability 56 per cent.

White Leghorn pullets fed a scratch ration of yellow corn and a mash of ground yellow corn, meat scrap, and dried buttermilk produced an average of 58 eggs from November 1 to May 1, of which 91 per cent were fertile, and 76 per cent of these hatched. A similar lot fed white corn instead of yellow produced 37 eggs, 85 per cent of which were fertile, and 65 per cent hatched. Replacing the meat scrap in the latter ration with soy bean meal and a mineral mixture in place of the dried buttermilk apparently reduced the egg production more than half and also decreased the fertility and hatchability. The addition of ground alfalfa leaves to the white corn ration gave the best results. Pullets in this lot produced 74 eggs, 90 per cent of which were fertile, and 86 per cent of these hatched.

The effect of an inadequate ration on the production and hatchability of eggs.—Continuing this project (E. S. R., 52, p. 474), it was found from a biological analysis that eggs from hens which received ultra-violet light either from direct sunshine or from a quartz mercury arc light contained more vitamin D than eggs from hens receiving sunlight through window glass.

A study was made of the relative antirachitic value of sources of ultra-violet light and various substances containing vitamin D as measured by the development of growing chicks fed an adequate diet. As indicated by the weights of chicks at 56 days of age, ultra-violet light from a glass tube for 9.5 hours daily gave best results. This was followed by 0.5 per cent cod-liver oil in the ration, direct sunlight, ultra-violet light through a quartz tube for 15 minutes, ultra-violet light through a glass tube for 8.25 hours, 2 per cent irradiated cottonseed oil, 2 per cent irradiated Wesson oil, and sunlight diffused through window glass.

Relation of adequacy of diet to disease.—Experiments indicated that there was little relationship between losses due to avitaminosis A in adult chickens and the mineral content of the feed or the presence or lack of vitamin D.

Feeding experiments with Leghorns, L. W. CASSEL (*Washington Col. Sta. Bul. 210 (1927), pp. 32, figs. 13*).—The results of three experiments are reported in this publication. Two of these have been previously noted (E. S. R., 56, p. 567).

The third is a comparison of ground v. unground grain mixtures with sour skim milk for laying hens, with a standard laying ration. Seven pens of 20 Single Comb White Leghorn pullets hatched May 16 were fed from November 1, 1925, to October 31, 1926, in pens 15 by 6 ft., with a cinder yard 324 sq. ft. in area. Sour skim milk, grit, oyster shell, and charcoal were available at all times in all lots. The green feed for all lots consisted of dried alfalfa leaves in the fall and winter and green alfalfa in the spring and summer.

Lot 1 received the W. S. C. standard laying ration, consisting of scratch and laying mash. Lots 2, 3, and 4 received a scratch, no mash ration, consisting in lot 2 of 66 lbs. of wheat and 34 lbs. of oats, in lot 3, 50 lbs. of wheat, 25 lbs. of oats, and 25 lbs. of barley, and in lot 4, 35 lbs. of wheat, 35 lbs. of cracked yellow corn, and 30 lbs. of oats. In lots 5, 6, and 7 the birds received a whole grain mash, no scratch ration, consisting of the same feeds in the same proportions as in lots 2, 3, and 4, respectively, except that the grains were ground.

The results indicate that under the conditions of this experiment, the ground grain mixtures (no scratch) with sour skim milk were somewhat superior to unground grain (no mash) or the standard laying ration for feeding producing hens.

Feeding and housing for laying hens, W. L. QUAYLE and A. CHRISTENSEN (*Wyoming Sta. Bul. 149 (1927), pp. 31, figs. 3*).—The results of two years' experiments in feeding pullets show that with a ration containing 20 per cent of protein there were produced over 50 dozen more eggs per year from a flock of 100 birds than with a ration containing 10 per cent of protein. Pullets receiving the high protein ration returned a greater profit than the low protein flock.

Insulating a poultry house with straw showed an annual increase in egg production of over 62 doz. eggs per flock of 110 birds over a noninsulated house. A large portion of this increase was during the winter months when the price of eggs is high.

Pullets produced 1,909$\frac{11}{12}$ doz. eggs per year as compared to 1,288$\frac{1}{12}$ doz. eggs for yearling hens. The pullets also increased 48 per cent more in weight than did the hens.

A comparison of the growth of chicks behind window glass and a glass substitute, W. F. WOOD, JR. (*Poultry Sci., 6 (1926–27), No. 2, pp. 62–70, figs. 2*).—Since ordinary window glass does not permit the radiation of ultraviolet rays, this experiment was undertaken to test the effect upon growth of a glass substitute.

Three groups of 25 chicks each were fed the ration of Hart et al. (E. S. R., 47, p. 871) which produces leg weakness. Lot 1 was placed behind ordinary window glass, lot 2 behind Cel-O-Glass, and lot 3 was kept under the same conditions as lot 1 but fed 2 per cent of cod-liver oil in addition to the basal ration. Weights were taken individually each week.

Only the group receiving sunlight through window glass developed leg weaknesses, and a study of leg bones from chicks in this lot showed anatomical rickets. Lot 1 made a subnormal growth, lot 2 normal, and lot 3 about normal. The value of a glass substitute depends upon (1) its power to transmit the protective rays, (2) the season of the year, and (3) the amount of pure sunlight during the midday hours.

Early growth rates of chickens with special reference to ultra-violet light, H. D. GOODALE (*Amer. Jour. Physiol., 79 (1926), No. 1, pp. 44–60, figs. 5*).—

The author found that early growth rate in chicks in excess of that reported as "normal" may be obtained. Chicks hatched in the early part of the season grew faster than those hatched in the latter part. Chicks from hens 2 years old and over were heavier at 30 days of age than those from hens 1 year of age.

Irradiation of chicks from 5 to 15 seconds daily with a mercury vapor lamp was ineffective in promoting growth. Thirty seconds was not completely adequate, but 1 minute gave as good results as exposures up to 3 hours. Radiation from 1 to 10 minutes twice weekly gave normal growth, while less frequent radiation appeared inadequate. There were some indications that prolonged radiation retarded growth. Winter sunlight appeared to be both growth promoting and a preventive of leg weakness.

Exposing the dry mash to a mercury lamp for 10 minutes appeared to favor growth but did not wholly prevent leg weakness, while exposure to sunlight for 30 minutes did not favor growth. Forced feeding nonirradiated chicks with the droppings of irradiated chicks was ineffective in promoting growth.

Rearing of pullets in confinement, F. R. BEAUDETTE, J. J. BLACK, and C. S. PLATT (*New Jersey Stas. Hints to Poultrymen, 15 (1927), No. 6, pp. 4, fig. 1*).—Directions are given for rearing pullets in confinement, especially in regard to prevention of infection from internal parasites. The construction of houses and yards, amount of feeding and floor space necessary, and the water and feed supply are discussed.

Influencing the development of the chick (*Connecticut Storrs Sta. Bul. 142 (1926), pp. 179, 180, figs. 2*).—During normal incubation a sudden increase in mortality beginning on the seventeenth day is noted, and about 65 per cent of the eggs hatch. When developing eggs were injected on the sixth day with 2 cc. of a physiological salt solution, after an initial mortality due to the injection, there is only a slight increase in mortality in the later stages and about 50 per cent of the eggs hatch. When a small amount of lithium chloride is added to the fluid injected the reaction is the same as above up to the nineteenth day, when a high mortality occurs bringing the hatch down to 30 per cent. These results led to the belief that the cause of the late peak mortality may be sought in the early stages of incubation.

Value of milk in the chick ration (*Iowa Sta. Rpt. 1926, pp. 27, 28*).—An experiment was conducted to compare the antirachitic properties of whole and skim milk. Weights were taken at the end of 8 weeks to determine the value of the various rations in promoting growth. Corn and milk did not produce normal growth. Adding 3 per cent of a mineral mixture increased the weight per chick. The addition of casein to the minerals did not improve the value of the ration. Whole milk contained more of the antirachitic vitamin than skim milk. Exposure to ultra-violet light prevented leg weakness, stimulated feed consumption, and increased the weight of the chicks.

Rickets in chicks, I, II, G. F. HEUSER and L. C. NORRIS (*Poultry Sci., 6 (1926–27), Nos. 1, pp. 9–17, figs. 2; 2, pp. 94–98, fig. 1*).—In the first of these two articles, 3 tests with White Leghorn chicks to determine the variation in the antirachitic properties of different brands of cod-liver oil are reported. Seven brands were selected at random, two of American origin and five Norwegian refined oils. In the first two trials the rations were typical chick rations, but in the third trial the feed was given entirely in the form of mash. The cod-liver oil was so mixed in the feed as to constitute 0.5 per cent of the ration. Each trial was of 8 weeks' duration, and chicks were confined without exposure to direct sunlight throughout each trial. Only vigorous normal chicks were used, and they were weighed individually when transferred from the brooder

and weekly thereafter, except in trial 1, when they were weighed only at the end of the test.

The authors found that different brands of cod-liver oil vary significantly in their vitamin content when measured by means of chicks. With plenty of calcium and phosphorus in the ration the amount of cod-liver oil necessary to protect against rickets depends upon the antirachitic potency of the oil and the amount of this factor stored in the body of the chick at the time of hatching.

In the second article of the series 4 different grades of cod-liver oil were studied to test their antirachitic values for chicks. One was an American refined cod-liver oil tested biologically, another was an untested American refined oil, the third a Norwegian refined oil, and the fourth a brown cod-liver oil. These oils were incorporated at the rate of 0.2 per cent in both grain and mash. One lot was fed as a check.

Results indicate that only the tested and brown cod-liver oil provided complete protection against rickets. Three individuals from each lot were taken for bone analysis. There was no lameness nor beading on the ribs of any chick on either the tested, brown, or untested American refined oils, although the mineral content in the last lot was somewhat lower than in either other case. In the lot receiving the Norwegian refined oil the mineral contents of the bone were low, and lameness and beading on the ribs were evident.

Care and management of baby chicks, W. C. Thompson and F. H. T. Clickner (*New Jersey Stas. Circ. 199 (1927), pp. 32, figs. 31*).—This is a revised edition of Circular 169 previously noted (E. S. R., 51, p. 777).

DAIRY FARMING—DAIRYING

The principles of dairy-farming, G. H. Garrad (*London: Ernest Benn, 1926, pp. 199*).—This book is intended for the practical dairyman dealing with the management and feeding of dairy cattle. The problems of selecting and stocking a dairy farm, together with the handling and disposal of the milk, are discussed.

[Dairy experiments at the Connecticut Storrs Station] (*Connecticut Storrs Sta. Bul. 142 (1926), pp. 169–171, figs. 2*).—The results of experiments are briefly noted, some of which have been previously mentioned.

Types of corn for silage for milk production [and effect upon consumption of hay].—This is a continuation (E. S. R., 52, p. 174) of work on types of corn for silage. When fed on a dry matter basis it was found that the feeding value of the early, medium, and late types of corn was equivalent pound for pound. Cows and heifers both consumed a greater amount of hay when fed silage made from late type corn.

Care of milking machines.—This is a preliminary report of studies in which it has been found that the chlorine disinfectants commonly used lose strength rapidly in warm weather. At this time the double strength solution should be used and new solutions made twice a week or 4 oz. of disinfectant added daily. Running water below 55° F. is effective in keeping down the bacteria count.

[Feeding experiments with dairy cattle at the Kansas Station] (*Kansas Sta. Bien. Rpt. 1925–26, pp. 94–99, 101*).—The results of several experiments with dairy cattle are noted.

Factors influencing the mineral metabolism of dairy cows.—This is a continuation of work previously noted (E. S. R., 52, p. 477). Four cows were kept in a barn away from direct sunlight and fed winter rations. The calcium,

phosphorus, sulfur, and magnesium balance was determined during two 1-week periods; then the cows were treated 15 minutes per day with ultra-violet light, during which time the balance was again determined. This was followed by two 1-week periods without light. No increase in mineral balance was found during exposure to light.

Sunlight in relation to the growth of calves.—Two lots of 4 Holstein calves each were fed the same ration, consisting of whole milk until 6 weeks of age and skim milk to 5 months of age, prairie hay, and a grain mixture of white corn, wheat bran, and linseed oil meal. One lot was housed in a darkened shed, while the other lot had access to direct sunlight. Blood samples were taken for calcium and phosphorus determinations at the beginning and at 60-day intervals. Two calves in the sunlight group refused to drink milk consistently and became stunted, and one calf in the darkened pen died of pneumonia. There was little difference in the physical appearance of the two lots and no evidence of rickets. The blood of both lots was normal. Neither lot made normal growth on the ration fed.

[*Feeds for dairy cattle*].—A lot of 9 cows was fed by the double reversal system through three 30-day periods, in which the first 10 days of each was considered preliminary, to compare ground soy beans and linseed oil meal. Alfalfa hay and topped cane silage formed the roughage part of the ration, and the concentrated part consisted of 4 parts corn chop and 1 part protein supplement. Linseed oil meal was fed through the first and third periods and ground soy beans of inferior quality through the second period. Slightly more milk was produced when linseed oil meal was fed, but the fat production was slightly higher while on ground soy beans.

Ground kafir, ground sorgo seed, and corn chop were fed with alfalfa hay to 3 lots of 4 heifers each for a 6-months period to compare their effect upon growth. The daily gains were somewhat greater for those fed corn chop. The heifers fed sorgo made greater increases in height than the other lots. The heifers in the corn lot ate less salt than in the other lots and showed less tendency toward a depraved appetite.

Dairy calf feeding investigations.—Calves fed ground kafir and ground sorgo seed made slower gains than those fed ground corn, but in growth they were slightly superior at 6 months of age. Dried buttermilk diluted with nine times its weight of water caused some digestive disturbances; also considerable difficulty was experienced in getting calves to drink the mixture.

Silage investigations.—The hour of the day that the sorgo was harvested had a noticeable effect upon its composition. A sample cut at 2 p. m. contained 50 per cent more sugar than a sample cut at 6 a. m. The starch content of the green sorgo remains unchanged in the silo. The sugars almost entirely disappear, being replaced by acids. There is little difference in the quantity of protein, ether extract, and crude fiber found in cured silage as compared with the green sorgo. The loss of material resulting from ensiling varies from 1.07 to 4.77 per cent. The moisture content of the cured silage is about 1 per cent higher than that found in green sorgo.

A study of the use of fly repellents for the control of flies on dairy cattle.—The results of 2 years' work with 5 fly repellents used on 32 cows showed that the number of flies on cows were reduced when sprayed. There was a slight increase in the amount of milk given during the time the cows were being sprayed.

The feeding of cows, A. C. M'Candlish (*Scot. Jour. Agr.*, *8* (*1925*), *No. 1*, *pp. 55–59*).—The results of several experiments in feeding dairy cows are reported.

Steamed bone flour as a mineral supplement for milk cows.—Two lots of 4 cows each were fed for three periods of 25 days each by the double reversal method. The first 5 days of each period were considered preliminary. All animals were fed the same ration and amount of roughages, while the concentrates were fed according to production and condition. The mineral supplement was added to the grain ration of lot 1 during the first and third periods and to lot 2 during the second period. It was fed at the rate of 0.5 lb. per cow daily.

The steamed bone flour had no marked effect upon the milk or butterfat production. When the milk was subjected to a standard rennet test no significant variations were found in the acidity or rates of coagulation of the different samples.

Water for dairy cows.—Over a period of 90 days cows consumed on the average 9.18 gal. of water per head per day, or 5.5 gal. of water per gallon of milk. The cows varied in their individual requirements for water and in the consumption from day to day.

Salt for cows.—Four cows producing 17 lbs. of milk per day consumed 0.75 oz. of salt over a 90-day period while kept in a barn. When turned on pasture, 2 cows of the same group produced an average of 18 lbs. of milk and consumed 0.02 oz. of salt per day. In another herd 18 cows consumed an average of but 0.03 oz. of salt per day. It was evident that the salt requirements of a cow are controlled by her individuality and production and by the nature of her ration.

Grapefruit refuse as a dairy feed, J. M. Scott (*Florida Sta. Rpt. 1926, pp. 25, 26*).—Two lots of cows were fed by the reversal method for three periods. During the first period all cows were fed alike. During the second period grapefruit refuse, analyzing moisture 18 per cent, fat 5.25, protein 5.31, carbohydrates 61.69, and fiber 9.75 per cent, was added to the grain ration of one lot and during the third period the rations were reversed. The grapefruit refuse seemed to have a tendency to increase the milk flow.

The length of the interval between calvings, H. G. Sanders (*Jour. Agr. Sci. [England], 17 (1927), No. 1, pp. 21–32, fig. 1*).—An attempt has been made to ascertain the best interval between calvings so that a cow's weekly yield of milk over a long period may be at a maximum. From the data tested indications are that a cow should calve at intervals of not less than a year and not more than 13 months.

The influence of the stage of lactation and the breed of the cow on the yield and quality of the milk, T. J. Drakeley and M. K. White (*Jour. Agr. Sci. [England], 17 (1927), No. 1, pp. 118–139, fig. 1*).—An analysis of the records of 48 dairy shows held by the British Dairy Farmers' Association indicates that the percentage of fat in both morning and evening milk decreases until about the fortieth day, when the minimum is reached, after which a steady rise occurs. The yield of milk increases at first and reaches a maximum at about the forty-fifth day after calving. From that time there is a steady decrease. The shorter the time between milkings the smaller is the yield of milk and also the percentage of solids-not-fat, but the greater the percentage of fat. The yield of solids-not-fat increases until about the thirtieth day and then decreases. Based on these data, the British Friesian breed led all others in yield of milk, while the Jersey breed was high in percentage of fat.

Studies on "cream line" formation, F. J. Doan (*Pennsylvania Sta. Bul. 204 (1926), pp. 21, 22*).—The first sentence of the abstract previously given under this title (E. S. R., 56, p. 171) should read "The temperature of the pasteurization media did not appear to affect the creaming ability unless it was higher than 212° F."

A pure milk supply, A. CUNNINGHAM and T. GIBSON (*Edinb. and East of Scot. Col. Agr. [Pub.] 1, n. ser. (1926), pp. 24*).—This is a comprehensive study of the character and source of bacterial contamination of milk. Suggestions on the production of milk free from contamination and the value to the producer of such milk are made by the authors.

A farm dairy sterilizer, N. S. GOLDING (*Brit. Columbia Dept. Agr., Dairy Circ. 13 (1926), pp. 6, fig. 1*).—This is a description of a simple and economical sterilizer for farm milking utensils with directions for its use. A bacterial analysis made on cans cleaned with this apparatus showed that they were rendered practically sterile by steaming for not less than 3 minutes.

[Experiments with dairy products at the Kansas Station] (*Kansas Sta. Bien. Rpt. 1925–26, pp. 101–103*).—The results of two experiments are noted.

Ice cream investigations.—Results of comparisons between the butyl alcohol and Mojonnier tests for butterfat in ice cream showed that they checked very closely and could be used interchangeably.

Corn sugar may be used to replace 30 per cent of the cane sugar in an ice cream mix without injurying the body, flavor, or texture. Mixes containing corn sugar freeze slower and the amount of time required for freezing was in direct proportion to the amont of corn sugar present. Overrun was obtained with more difficulty, and the larger the amount of corn sugar present the greater the difficulty.

Bacteriological studies of ice cream.—In continuing the studies of the bacterial content of ice cream (E. S. R., 54, p. 573), considerable light was thrown on the characteristics of the organisms producing "pin point" colonies. These bacteria are thermotolerant but not thermophilic. They develop an agar only in the presence of sugar.

The present status of density of ice cream, G. D. TURNBOW (*Ice Cream Rev., 10 (1927), No. 7, pp. 60–63, figs. 3*).—Efforts to standardize the weight or density of ice cream, as conducted at the University of California, are reported.

Several factors which might have an influence on density were studied. The first of these factors was agitation. Mixes were divided and processed in identical manner, but one mix was agitated severely and the other just enough to prevent cooking flavors from developing. The slow agitation mix developed nearly twice as much viscosity during aging as the mix which was severely agitated.

A more stable viscosity was secured by aging the mix at from 33 to 34° F. than by aging at higher temperatures. Ice cream aged at this temperature developed superior body and texture. Work with varying speeds of the dasher, ranging from 71 to 211 r. p. m., showed a variation in the retention of the initial viscosity of the mix ranging from approximately 74 per cent of the initial viscosity to only 26 per cent.

The percentage of total solids also had an effect upon the density of ice cream, especially upon the parts drawn off the freezer at different times. The higher the percentage of total solids the less difference there was between the weight of the first, second, and fourth cans of ice cream drawn off. A table illustrating three possible standards for ice cream weights are included. The author recommends one of these standards.

Adjustment of composition important, F. J. DOAN (*Butter, Cheese, and Egg Jour., 1927, Feb. (mo. ed.), pp. 23, 24, 26, 27*).—The author describes methods of standardizing mixes for the manufacture of uniform high quality sweetened condensed milk. It has been found that it is almost invariably necessary to add skim milk or to remove cream to adjust the mix, and examples of both procedures are described.

The acidity question, C. D. DAHLE (*Ice Cream Trade Jour., 22 (1926), No. 12, pp. 49–51*).—The control of acidity in the ice cream mix is described. The flavor of ice cream depends in a large measure upon the acidity of the mix. High acidity also retards the time required to obtain a 100 per cent overrun and makes the freezing time longer. Reducing the acidity of an already low acid mix to a point below 0.15 per cent results in bitter soapy flavors.

The use of "neutralizers" depends for their efficient use upon a knowledge of each and the skill of the operator using them. The use of too much neutralizer results in poor flavor due to the presence of salts formed by the acids and alkalies. An acidity of 0.2 per cent may be considered normal.

VETERINARY MEDICINE

[Progress report on animal diseases in Connecticut] (*Connecticut Storrs Sta. Bul. 142 (1926), pp. 168, 169, 180*).—Reference is made to blood testing and the eradication of infectious abortion as successfully undertaken in the college herd, commencing in March, 1925. The owners of 40 herds, averaging 30 head, adopted the plan employed, which consists in the removal of all reactors, the abortion-free heifers being added, with the result that 15 herds are now free from the infection. The attempt to perfect an abortin for use in diagnosis gave encouraging results.

Brief reference is made to studies of the toxicity of *B. pullorum* in eggs, a detailed account of which by Rettger, Slanetz, and McAlpine has been noted (E. S. R., 56, p. 678). In continuation of control work with blackhead of turkeys 50 young poults were placed in each of three lots. The first lot was kept on the weekly yard rotation plan, the second was kept on the same ground during the entire rearing season but the yard was allowed to rest from about November 15 to the following May, and the third was kept on the same ground all the season, but the ground was occupied constantly from November 15 until the following May by maturing and mature turkeys. The loss in the lot kept on the rotation plan was less than half as great as with the other two, between which there was little difference in the mortality.

A continuation of the study of fowl paralysis by Pappenheimer (E. S. R., 55, p. 73) led to the discovery that this fatal disease occurs in all parts of the United States, the characteristic changes which it produces in the nervous system being found in apparently normal chickens, also in birds which do not have coccidiosis or any intestinal parasites. It was found that the infection may be transmitted to young chicks which do not show the disease until about two months after inoculation.

Report of the veterinarian, A. L. SHEALY (*Florida Sta. Rpt. 1926, pp. 85–94, figs. 2*).—The author reports upon the work of the year with salt sickness in cattle, which led to the conclusion that this is due to a nutritional deficiency.

In observations of some 200 flocks of poultry infested with Manson's eye worm the percentage of infestation varied considerably both in the flocks and in the infested birds, since some individuals had as few as one or two while others had as many as 100. Observations of the life history of the worm by D. A. Sanders are reported upon. Eggs placed in sterile soil with an abundant supply of organic matter hatched under favorable conditions, and within two months attained a length of 1.5 mm. The experiments indicate (1) the elimination of immature, noninfective stages of the parasite, (2) the need of a period of incubation in the soil or water longer than the exposure allowed in this experiment, (3) the existence of an intermediate host, and (4) that adult parasites are not transmitted directly from one bird to another.

Data obtained in a study of leeches in horses are briefly noted.

Diseases of farm animals (*Kansas Sta. Bien. Rpt. 1925–26, pp. 118–123, 124, 126, 127*).—A brief reference is made to the results of post-mortem and laboratory examinations of diseased animals and tissues, followed by abortion disease investigations, an account of which is given in Technical Bulletin 14 (E. S. R., 52, p. 779). In blackleg investigations it was found that the virulence of cultures depends upon the presence of (1) living cells, (2) aggressins produced by these cells, and (3) a lethal substance found in virulent *Clostridium chauvei* cells. Ferric sulfate, ferric chloride, and ferrous sulfate were added to the various media, and it was found that the ferric sulfate greatly increased the virulence of a number of strains in the organism. One strain which had been avirulent since 1921 was stimulated to such a degree that it again killed guinea pigs and calves.

Attempts to produce permanent immunity to hog cholera in natally immune pigs by use of the virus are briefly referred to.

In reporting upon poultry disease investigations a table is given of the results of examinations made of diseased birds sent to the laboratory for diagnosis. Two outbreaks of paratyphoid in chicks were diagnosed, the basis being the isolation of an organism which morphologically resembles *Salmonella schotmulleri*. Work on bacillary white diarrhea consisted of studies of the agglutination test for detection of *S. pullorum* infection carriers, preparation and preservation of test fluids, preservation of blood serum, distribution of bacillary white diarrhea in Kansas, mortality of chicks in bacillary white diarrhea outbreaks, complement fixation for *S. pullorum* infection in adult birds, and the transmission of bacillary white diarrhea in incubators (E. S. R., 55, p. 374). During the biennium 9,440 agglutination tests were made and in addition 300 complement fixation tests to compare the relative efficiency of the agglutination and complement-fixation tests. To date a close correlation of results has been obtained by the two methods. A summary of studies of the mortality in eight outbreaks of bacillary white diarrhea is given in tabular form. The work indicates that lossses seldom start before the fourth day after the chicks are hatched and that the heaviest losses occur from the fourth to the tenth day. Losses are seldom observed from the acute type of the disease after the fourteenth day.

Reference is made to a study of the value of bacterins from the different strains of *Pasteurella avicida* and to the development of serological tests demonstrating immunity. In parasitological investigations the large roundworm of poultry (*Ascaridia perspicillum*) was given particular attention. It was found that the thymus glands of parasitized chicks become reduced in size; that the blood-sugar content of growing chicks is reduced during parasitism; that bleeding affects the resistance of the chickens to parasites, repeated bleeding making young chickens more susceptible; and that chicks from 5 to 100 days old became progressively more susceptible to parasitism. Chickens whose diet lacked Vitamin B were much less resistant to parasitism than those whose diet contained it. In studies of the viability of the worm eggs under out-of-door conditions it was found that during the period between July 21 and August 20 all eggs on the surface and those buried 2 and 4 in., respectively, were killed by heat from the sun in unshaded soil, but many of the eggs placed similarly in shaded soil survived. Temperatures of −20° F. were found to be sufficient to kill embryonated eggs when placed on the surface of the soil, but a burial of 4 in. gave sufficient protection to enable large numbers of eggs to survive such freezing.

During the course of studies of the behavior of nematode larvae in the host, larvae of nine nematodes belonging to three families were observed.

Larvae belonging to the family Ascaridae upon hatching from the eggs in the intestine of the host bored through the wall of the intestine and migrated to the liver, lungs, and trachea, and back to the intestine again before settling down to grow to maturity; larvae belonging to the family Heterakidae have a tendency to migrate, but they seldom bore through the wall of the intestine; and larvae of the family Oxyuridae appear not to have the migratory habit. Studies made on filaria nematodes occurring in poll evil and fistulous withers in horses afford strong evidence that a nematode may be the cause of these two important disorders.

Annual administration report of the Civil Veterinary Department in Ajmer-Merwara (British Rajputana) for the year 1924–25, J. H. G. Jerrom (*Ajmer-Merwara Civ. Vet. Dept. Ann. Admin. Rpt. 1924–25, pp. 12*).—This is the usual annual report (E. S. R., 52, p. 377).

Annual report of the Civil Veterinary Department, Bihar and Orissa, for the year 1925–26, P. B. Riley (*Bihar and Orissa Civ. Vet. Dept. Ann. Rpt. 1925–26, pp. [4]+20+XXVI+4, pl. 1*).—This is the usual report (E. S. R., 55, p. 70).

Report on the Civil Veterinary Department, Burma (including the Insein Veterinary School), for the year ended the 31st March, 1926, T. D. Stock (*Burma Civ. Vet. Dept. Rpt. 1926, pp. [6]+24, pl. 1*).—This is the usual annual report (E. S. R., 54, p. 574).

The transfusion problem, C. A. Doan (*Physiol. Rev., 7 (1927), No. 1, pp. 1–84*).—This contribution from the Rockefeller Institute for Medical Research is presented in connection with a bibliography of 717 titles.

Further studies of the isolation and cultivation of Bacterium abortus (Bang), I. F. Huddleson, D. E. Hasley, and J. P. Torrey (*Jour. Infect. Diseases, 40 (1927), No. 2, pp. 352–368*).—This is a report of work at the Michigan Experiment Station.

The authors find that the growth activity of *B. abortus* is governed by an increased carbon dioxide tension, by the liberation of hydrogen sulfide, and the formation of ammonium magnesium phosphate, the production of the latter two substances being controlled by an abundance of carbon dioxide and the reaction of the culture medium. It is pointed out that there is a biochemical reaction which serves to distinguish *B. abortus* from *Brucella melitensis*, that is, in the formation of ammonium magnesium phosphate and liberation of hydrogen sulfide. *B. abortus* may be measured quantitatively in infective milk with a high degree of accuracy by employing, as a culture medium, gentian violet, beef liver infusion agar, and incubating in an atmosphere containing from 5 to 10 per cent carbon dioxide. In the gravity separation of cream the rising fat globules and body cells carry with them the majority of the abortion bacteria in milk. The culturing of the gravity cream layer of milk is as efficient for determining the presence of *B. abortus* in milk as are guinea-pig inoculation methods. *B. abortus* does not appear to multiply in milk held at ice-box temperatures and decreases in numbers rapidly when held longer than eight days. The number of colonies of *B. abortus* which develop on plated culture medium decreases as the length of time they are held aerobically at 37° C. increases.

Bovine infectious (contagious) abortion of cattle, with a short account of the disease in swine and sheep, C. P. Fitch, W. L. Boyd, and R. E. Lubbehusen (*Minn. Univ. Agr. Ext. Spec. Bul. 28, rev (1925), pp. 33, figs. 12*).—This revision (E. S. R., 42, p. 676) is a practical summary of information.

Human infections with organism of contagious abortion of cattle and hogs, A. C. Evans (*Jour. Amer. Med. Assoc., 88 (1927), No. 9, pp. 630–632*).—In

this discussion of the subject the author presents abstracts of 20 cases of infection which have been reported from man in this country, and briefly refers to 35 cases of undulant fever in South Africa due to *Brucella melitensis abortus* and to other outbreaks in Italy and a case in Palestine.

Meningitis due to B. enteritidis Gaertner, G. STUART and K. S. KRIKORIAN (*Jour. Hyg.* [*London*], *25* (*1926*), *No. 2, pp. 160–164, fig. 1; abs. in Jour. Trop. Med. and Hyg.* [*London*], *29* (*1926*), *No. 22, p. 385*).—The authors describe a case which they consider unique in that no reference has been found in medical literature to meningitis due to *Bacillus enteritidis*. It is pointed out that only 9 cases of meningitis have been traced to the paratyphoid group of organisms, 7 to *B. paratyphosus* B, 1 to *B. paratyphosus* A, and 1 to a bacillus of undifferentiated type.

Can the cattle tick Haemaphysalis bispinosa act as the carrier of piroplasmosis (Piroplasma bigeminum)? An experimental enquiry, J. LEGG (*Aust. Jour. Expt. Biol. and Med. Sci.*, *3* (*1926*), *No. 4, pp. 203–216*).—According to the author's investigations, the engorgement of *H. bispinosa* in each of the several stages of its life history on an animal recently recovered from piroplasmosis, followed by engorgement on a different susceptible animal in each of the three subsequent stages of its life history, failed to convey the disease. All the susceptible cattle subsequently reacted to inoculation with virulent blood. The experiments indicate that this tick does not act as an intermediate host of bovine piroplasmosis.

On the use of trypanblue in the treatment of the piroplasmoses of ruminants [trans. title], A. DONATIEN and F. LESTOQUARD (*Bul. Soc. Path. Exot.*, *20* (*1927*), *No. 1, pp. 64–77, figs. 10*).—The authors find that the action of trypanblue is specific in the treatment of the true piroplasmoses of bovines and ovines and that no other treatment has as effective therapeutic action. The resistance to its action by the Babesiella appears to be a generic characteristic.

Some experiences on serum-simultaneous method of inoculation for rinderpest in the field, C. DANDAYUTHA PANI (*Indian Vet. Jour.*, *3* (*1927*), *No. 3, pp. 164–172*).—In reporting upon his experiences with the serum-simultaneous method of inoculation for rinderpest, the author points out that, while it produces an immunity in the inoculated animals for a considerably longer time than does the "serum-alone" method, it has a number of disadvantages.

The chemotherapy of surra (Trypanosoma evansi infections) of horses and cattle in India, J. T. EDWARDS (*Roy. Soc. Trop. Med. and Hyg. Trans.*, *20* (*1926*), *No. 1–2, pp. 10–73, pl. 1, figs. 9; abs. in Vet. Rec.*, *7* (*1927*), *No. 3, pp. 56–59, fig. 1*).—Considering the result of treatment of surra with Bayer 205, the author discusses the dosage, toxic symptoms, intrathecal injection, initial peripheral sterilization, duration of peripheral sterilization after the administration of single doses, treatment with repeated doses, combined intravenous-intrathecal administration, and prophylactic action. He next discusses the treatment of surra with tartar emetic, including the minimum lethal dose for cattle; treatment of surra in buffaloes; treatment of equine surra; and prophylactic action. Then follows a discussion of the use of tryparsamide for surra, including treatment in buffaloes, cattle, and equines. The treatment of surra with bismuth compounds is next considered, including treatment of surra in cattle and in horses.

It is concluded that outbreaks of surra in cattle, including buffaloes, are easily checked by the administration of injections intravenously of relatively simple trypanocidal agents, such as tartar emetic or bismuth phosphate, single injections usually being sufficient. With equines the results obtained with applications of Bayer 205 surpassed those obtainable by other medicaments.

Intravenous administration of 5 gm. in 10 per cent aqueous solution per 1,000 lbs. body weight is said to be a suitable therapeutic dose.

Livestock diseases (*Florida Sta. Rpt. 1926, pp. 123–125*).—In investigations of livestock diseases in the Everglades in the summer of 1925, A. L. Shealy found sterility in cattle to be the most serious and prevalent disease.

Sheep losses in the feed lots, I. E. Newsom (*Colorado Sta. Rpt. 1926, pp. 39, 40*).—In studies of sheep losses in the feed lots much attention was given to the anaerobes that may be present in the carcasses of sheep which have died of various diseases, but particularly those that are presumed to have died from overeating. It was found that sore mouth in lambs was usually present during the last feeding season and in one or more instances caused the loss of a considerable number of animals. Observations indicated that *Actinomyces necrophorus* was present in most of the cases and that the affection might be properly considered a necrobacillosis. Coccidiosis is said to be on the increase and in some instances caused rather serious losses.

Breeding swine for natural resistance to cholera (*Iowa Sta. Rpt. 1926, p. 43*).—Investigations conducted indicate that either the 60 tested first-generation offspring from seven so-called immune sows lacked resistance to hog cholera, or that such resistance is recessive in its heredity.

Experimental investigations of epizootic cerebrospinal meningitis of the horse (Borna disease) [trans. title], W. Zwick, O. Seifried, and J. Witte (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 30 (1926), No. 1–2, pp. 42–136, pls. 8, figs. 5*).—An extended account of investigations conducted at the Institute of Veterinary Hygiene and Infectious Diseases at the University of Giessen is given in connection with a review of the literature, a list of 182 references to which is included.

The authors find that the diplostreptococci occurring in the brains of horses and rabbits affected with Borna disease are nonpathogenic and at most play only a secondary part in its etiology, the disease being caused by a filtrable virus. Experiments with both domestic and laboratory animals show that the affection is transmissible to the rabbit through intracerebral, intraocular, corneal, nasal, repeated intravenous, subcutaneous, and intraperitoneal injections and through the feeding of brain emulsion from the horse. It is also transmissible from rabbit to rabbit by intracerebral injection. The symptoms, the course of the disease, and the pathoanatomical and histological findings seen in experimental animals are similar to those of spontaneous Borna disease in the horse. It is pointed out that the virus of this disease is present principally in the central nervous system, not having been found in the blood or, with the exception of the salivary gland, in any of the internal organs.

In experimental work the subcutaneous and intraperitoneal injection of rabbits with infected brain material gave an immunity which protected against intracerebral injections that consistently killed control animals.

Range paralysis of poultry, H. J. Stafseth and E. P. Johnson (*Michigan Sta. Quart. Bul., 9 (1927), No. 3, pp. 105–109*).—This affection of poultry appeared in Michigan in the fall of 1921 with considerable frequence and has since increased in prevalence until it is now the most serious ailment affecting birds of from 4 to 14 months of age. While it has been found that leg weakness may be a symptom of a number of diseases, including tuberculosis, sarcomatosis, bacillary white diarrhea, fowl cholera, worm infestations, nutritional disturbances, botulism, and coccidiosis, the authors became convinced that a certain pathogenic agent must be responsible for the very prevalent disease in poultry which occurs in young stock in late summer, fall, and early winter. Their investigations led to the discovery that duodenal coccidiosis infection is prob-

ably the most important cause of this condition in fowls. They found that the coccidia may localize rather deeply in the mucous membrane of the duodenum and produce this condition. Five of twelve birds infected by feeding incubated or sporulated coccidia in bran mash were affected. The lesions, diagnosis, treatment, prevention, and care of infected flocks are briefly considered.

Cultural and antigenic studies on Salmonella gallinarum and Salmonella pullorum, H. G. May and K. Goodner (*Jour. Bact., 13 (1927), No. 2, pp. 129–146*).—In this contribution from the Rhode Island Experiment Station the details are given, largely in tabular form, of investigations conducted in connection with those previously noted (E. S. R., 55, p. 275).

The authors' study of the carbohydrate fermentation of 52 strains of *S. pullorum* and 31 strains of *S. gallinarum* shows that the members of each group agree very closely in the production of acid from these substances. It is pointed out that *S. pullorum* usually produces gas from fermentable carbohydrates while *S. gallinarum* never produces gas. The titration of antigens from these strains against antisera from 8 representative strains of *S. pullorum*, 5 representative strains of *S. gallinarum*, and 1 strain of *Eberthella typhosa* has been found to reveal no definite antigenic differences between the two groups of avian pathogens nor to reveal any subgroups with the exception of a slight differentiation within *S. gallinarum*. The authors regard both *pullorum* and *gallinarum* as belonging to the genus Salmonella, placed in the second edition of the manual of the Society of American Bacteriologists (E. S. R., 56, p. 326). A method for the rapid identification of these two species consists in passing suspected avian pathogens (Gram-negative rods) through glucose, dulcitol, lactose, and sucrose.

The chicken mite (Dermanyssus avium) and its control [trans. title], J. Köhnlein (*Arch. Wiss. u. Prakt. Tierheilk., 53 (1925), No. 2, pp. 144–180, figs. 10*).—This is an extended account of studies of *D. avium* in connection with a list of references to literature. An account of this pest, by H. P. Wood, has been noted (E. S. R., 37, p. 859).

Preliminary note on the transmission of the eye worm of Australian poultry, J. W. Fielding (*Aust. Jour. Expt. Biol. and Med. Sci., 3 (1926), No. 4, pp. 225–232, pl. 1*).—The author's experiments here reported are considered to present indisputable evidence that the cockroach, *Leucophaea surinamensis* L., is a responsible agent for the transmission of eye worms of fowls and ducks. The cockroach apparently ingests the young larvae from the droppings and from the ground, the larvae passing through the wall of the alimentary tract, on the outside of which they encapsulate. In the capsules development takes place, and on attaining the stage of infectivity, they leave the capsules, and wander about in the body cavities, having been recovered from both the thoracic and abdominal cavities as well as from the legs. The infected cockroaches are in their turn taken up by the poultry, and, apparently, do not pass farther than the crops before the worms which have attained the infective stage escape from the intermediate host; they then pass up the esophagus to the mouth and eventually through the nasolachrymal duct to their destination.

The control of intestinal parasites, C. D. Carpenter (*Poultry Sci., 6 (1926–27), No. 2, pp. 79–86*).—A practical account.

Studies on the Ascaris lumbricoides, H. M. Martin (*Nebraska Sta. Research Bul. 37 (1926), pp. 78, figs. 3*).—This is a summary of the knowledge based upon a review of the literature in connection with a bibliography of 110 titles, and a report on investigation personally conducted. The author presents the details of 13 experiments on the life history of *A. lumbricoides* and 14 experiments on other phases of the subject. The data have been sum-

marized by the author as follows: It has been observed that the uteri from pig Ascaris as small as 125 mm. in length may contain eggs which will develop to the infectious stage when incubated at the proper temperature. Adult male Ascaris may attain a length of 310 mm. and females a length of 490 mm. Eggs subjected to a temperature of 31 to 34.5° C. in the presence of moisture and oxigen may develop to the vermiform stage in 10 days. Segmentation of the eggs does not take place if they are subjected to a temperature of —5 to 10°. Eggs placed at a temperature of from —5 to 10° in a dry condition were found to be viable after two years. Eggs kept at this temperature in a moist condition remained viable for over four years, at which time they were still capable of developing to the vermiform stage and producing Ascaris pneumonia in the cavia.

Hatching of Ascaris eggs occurs chiefly in the small intestine, and may occur in the alimentary tract of a guinea pig as early as two hours after ingestion. Hatching of the eggs does not seem to take place when they are introduced beneath the skin of pigs. Investigations show that the larvae migrate through the circulation from the intestine to the lungs by way of the liver and heart, thus confirming data presented by Stewart (E. S. R., 45, p. 160) and by Ransom and Foster (E. S. R., 43, p. 275). Evidence has been obtained which shows conclusively that Ascaris larvae, after having completed their vasculopulmonary circuit in pigs, will settle down and develop to maturity in the small intestine of this animal as early as 49 days after the ingestion of infectious eggs.

Pigs may become infested with intestinal Ascaris as a result of ingesting tissue which is infected with Ascaris larvae. Contact with rabbits which had been fed Ascaris eggs produced Ascaris pneumonia in normal rabbits, thus indicating a possibility that rodents may act as intermediate hosts, although it is quite obvious that this method of infection is by no means common in nature.

Pathologic changes may be observed in almost any organ in the body as a result of migrating Ascaris larvae. Intrauterine infection in swine with Ascaris appears to be very uncommon.

It is apparent that the Ascaris of man and swine are morphologically and biologically indistinguishable, but physiologically are distinct species; that is, adult Ascaris will not occur in the small intestines of swine from the ingestion of human Ascaris eggs, and vice versa. Ascaris infected pigs do not react allergically to the same extent that worm-infested horses do. It is also certain that a negative reaction is by no means an indication that the pig was not infested with Ascaris at some time during its life. It appears that the resistance acquired by pigs against Ascaris infection is due to an age factor and not to an immunity, at least not an immunity comparable to the one in microbic infections.

Epidemiological studies on respiratory infections of the rabbit.—IX, The spread of Bacterium lepisepticum infection at a rabbit farm in New City, N. Y., L. T. Webster (*Jour. Expt. Med., 45 (1927), No. 3, pp. 529–551, figs. 13*).—In an epidemic among thoroughbred rabbits on a farm in New City, N. Y., studied over a period of 2 years, 50 to 75 per cent of the total mortality was due to *B. lepisepticum* infection.

AGRICULTURAL ENGINEERING

[Agricultural engineering studies at the Colorado Station] (*Colorado Sta. Rpt. 1926, pp. 41–45*).—The progress results of studies by E. B. House of subgrade soils of Colorado, made in cooperation with the U. S. D. A. Bureau of

Public Roads, indicate that cracks in concrete pavement are less where there is a longitudinal center joint, where the pavement is thicker at the edges than at the center, and when a dowel is used. Where the grade is low the larger number of cracks are transverse to the center line of the road, and where the grade line is high they are parallel to the center line.

In a continuation of the study of humidifying air in buildings, G. A. Cumings found that two humidifiers which operate on the top of radiators and use absorbent material to increase the evaporation surface are of little value in buildings. In no case was the relative humidity of the air raised more than 2 per cent in a room under normal conditions.

Studies on fire protection by carbon dioxide gas by Cumings showed that this gas may be used efficiently and economically to extinguish small fires.

[Agricultural engineering studies at the Iowa Station] (*Iowa Sta. Rpt. 1926, pp. 9, 10*).—The progress results of studies of the air requirements of poultry conducted by the agricultural engineering section in cooperation with the poultry, chemistry, and veterinary physiology sections are briefly presented. A battery of 10 pens of approximately 37.5 sq. ft. of floor space each was used. Ten birds were placed in each pen and the pens closed. Each pen received a definite amount of air, varying by pens from ⅜ to 1½ cu. ft. per minute. No correlation could be found between air supply and egg production, fertility, or hatchability. While the moisture conditions, especially in the pens receiving the smaller amounts of air, would be considered very bad, the hens appeared contented and maintained egg production equal to those receiving a greater amount of air and slightly greater than similar hens kept on the poultry farm under normal conditions. Much less of the mash feed was consumed in the test pens than under normal conditions.

Tests of an airplane type of wheel for the generation of electricity by wind power showed that this type of wheel 10 ft. in diameter gives less power than the ordinary type of wheel 14 ft. in diameter. The airplane type seemed much more reliable and less likely to be damaged in wind storms. It was found that the summer months form the questionable period in the output of the plant due to lack of wind.

In an investigation of bituminous concrete, 3-in. creosote wood block, cork brick, concrete, rubber blocks, and 2-in. homemade wood blocks as dairy barn floor materials, the concrete and rubber blocks showed the least wear.

Report of the committee on the development of ground-water supplies, G. W. Putnam et al. (*U. S. Pub. Health Serv., Pub. Health Bul. 160 (1926), pp. 43–55, 135–138*).—This report was presented at the sixth annual conference of State sanitary engineers held at Louisville, Ky., in April, 1925. It considers the sanitary defects affecting the safety of water obtained from various types of ground water supplies and the safeguards which should be employed to remedy them.

Examples given of towns in which epidemics have occurred due to the various defects indicate that there are many sanitary defects in connection with ground water supplies which have in the past caused the intermittent infection of otherwise safe supplies. In many instances difficulty in adequately safeguarding a ground water supply amply justifies the continuous disinfection of the water as insurance against intermittent slight contamination. A code of principles on sanitary control in the development of ground water supplies is included.

Small water powers, F. J. Taylor (*Estate Mag., 25 (1925), Nos. 7, pp. 509–514, figs. 4; 8, pp. 596–604, figs. 9*).—Information is given on the design of small water power plants especially adapted for farm conditions.

Concrete, plain and reinforced.—Vol. 1, Theory and design of concrete and reinforced structures, F. W. TAYLOR, S. E. THOMPSON, and E. SMULSKI (*New York: John Wiley & Sons; London: Chapman & Hall, 1925, vol. 1, 4. ed., pp. XIV+969, pls. 7, figs. 327*).—This is the fourth edition of this book (E. S. R., 37, p. 590). It contains chapters on materials and methods for making concrete; reinforcement; tests of reinforced concrete; theory of reinforced concrete; reinforced concrete design; design of flat slab structures; concrete and reinforced concrete columns; foundations and footings; piles; building construction; wall bearing construction; basement walls; roof construction; stairways, fire exits, and elevator shafts; steel window sash; structural plans for buildings; architectural treatment of exterior and interior of reinforced concrete buildings (prepared by H. C. Robbins); concrete in construction of theaters and auditoriums; reinforced concrete in different types of buildings; reinforced concrete chimneys; retaining walls; and tables and diagrams.

Water gain and allied phenomena in concrete work, H. J. GILKEY (*Engin. News-Rec., 98 (1927), No. 6, pp. 242–244, figs. 3*).—The results of studies conducted at the University of Colorado are briefly reported which showed that the phenomenon of gaining water is a natural one, occurring in dry concrete mixtures as well as in wet ones. It results from an effort of the solids to sink to the lowest possible position. After the concrete has been poured and working has ceased, this settling will continue until the mass starts to stiffen and the displaced water will rise. It is considered likely, therefore, that in attempting to control the workability of the mixture by the insertion of a workability clause, such as the designation of the slump or the flow, such designation should apply to the concrete in the forms instead of to that at the mixer.

Sampling and testing of highway materials, W. H. BARTON, JR., and L. H. DOANE (*New York and London: McGraw-Hill Book Co., 1925, pp. IX+355, figs. 83*).—This book contains chapters on laboratory practice; sampling; Portland cement, Portland cement concrete, and paving brick; aggregates; miscellaneous materials; bituminous materials; specifications; curves, diagrams, and tables; and subgrade soils.

Tests of Kansas road materials, C. H. SCHOLER and H. ALLEN (*Kans. Engin. Expt. Sta. Bul. 15 (1925), pp. 68, figs. 6*).—A summary of the results secured on natural road building materials tested in Kansas (E. S. R., 50, p. 484).

Public Roads [February, 1927], (*U. S. Dept. Agr., Public Roads, 7 (1927), No. 12, pp. 233–252+[2], figs. 20*).—This number of this periodical contains the status of Federal-aid highway construction as of January 31, 1927, together with the following articles: Fill Settlement in Peat Marshes, by V. R. Burton; Determination of Consistency of Soils by Means of Penetration Tests, by C. Terzaghi; California Road Survey Demonstrates the Economic Possibilities of Subgrade Studies, by C. A. Hogentogler; Design of a Constant Temperature Moist Closet, by W. F. Purrington; Effect of Highway Slash on Infestation by Western Pine Beetle Studied (see page 860); and The Action of Calcium Chloride on Cements.

Cast iron in its relation to the automotive industry, E. J. LOWRY (*Jour. Soc. Automotive Engin., 20 (1927), No. 2, pp. 277–290, figs. 13*).—Studies are reported which tend to prove that true hardness is not measurable by any known test, that the present hardness test is not a function of machinability or of wear, and that combined carbon bears little relation to any of these three factors. The governing features seem to be the forms of carbon, the structure of the iron, and the quality of the materials used. The method used in determining quality of material was that of dilatation. This test

showed that the expansion of the casting is related to the expansion of the material used.

Applications of X-rays in the automotive industry, G. L. CLARK, R. H. ABORN, and E. W. BRUGMANN (*Jour. Soc. Automotive Engin., 20 (1927), No. 2, pp. 291–304, figs. 22*).—Studies conducted at the Massachusetts Institute of Technology are reported which included a résumé of X-ray science and of experimental results regarding practical applications to the examination of automotive materials. Special attention is devoted to the detection of imperfections in castings, the development of improved casting technique, the substitution of castings for forgings, and the X-ray examination of valves and other parts.

The rôle of metallic colloids in the suppression of detonation, H. L. OLIN, C. D. READ, and A. W. GOOS (*Indus. and Engin. Chem., 18 (1926), No. 12, pp. 1316–1318, figs. 4*).—Experiments conducted at the University of Iowa are reported in which gasoline was tested with different compounds. Experiments with straight gasoline treated with tetraethyl lead in different forms showed that the superiority of the fuels used was due to the presence of undecomposed ethyl rather than to the colloidal metal present. Further experiments with nickel carbonyl indicated that free metallic particles suspended in the combustion zone of the cylinder do not have a measurable effect in suppressing detonation.

Ultraviolet spectroscopy of engine-fuel flames, G. L. CLARK and A. L. HENNE (*Jour. Soc. Automotive Engin., 20 (1927), No. 2, pp. 264–269, figs. 2*).—Studies conducted at the Massachusetts Institute of Technology are reported in which details are given of the method of control of the engine so that quantitative and reproducible measurements of detonation and comparisons with spectra can be made. Typical data are presented with photographs of the free-burning flames of hydrogen, carbon monoxide, methane, gasoline in a blowtorch, and the like. The outstanding result obtained was that during detonation the first quarter spectrum extends far into the ultra-violet and that of the second quarter a somewhat less distance, the third and fourth quarters being characterized by very little radiation energy. During normal explosion or when knock suppressers, irrespective of their chemical nature, are used in the engine under detonating conditions the spectra of all four quarters have the same length and essentially the same intensity. Lead emission lines from tetraethyl lead appear only in the first quarter. This is taken to indicate that the action of an antiknock material occurs throughout the mixure rapidly, probably by thermal decomposition ahead of the explosion wave. The ultra-violet spectra show that all substances which act as knock suppressers have precisely the same effect, in that in their presence there is no emission in the far ultra-violet, such as occurs in detonation, and the energy liberated is distributed throughout the whole stroke instead of largely in the first quarter.

Flow of heat in pistons, H. A. HUEBOTTER and G. A. YOUNG (*Purdue Univ., Engin. Expt. Sta. Bul. 25 (1925), pp. 119, figs. 67*).—Studies are reported, the purpose of which was to establish the optimum distribution of metal in the trunk type of piston for thermal conductivity from the head to the cylinder wall.

The results showed that the head of uniform section is the best conductor of heat, and that the short barrel of tapered section is the best dissipator of heat. A head section thick at the circumference will assist in the dissipation of heat, and for this reason a large fillet is recommended at the junction of the head and the barrel. The addition of metal to the head was found to lower the maximum temperature more than the same volume of metal applied

to the barrel. The barrel should be as thick as the head section at the head end and as thin as practicable at the open end.

Ribs, when properly designed, were found to improve the conductivity more than an equal quantity of metal added to either the head or the barrel. The proportions of the head, the barrel, and the ribs are mutually dependent for best performance. The triangular rib, extending from the center of the head to midway the length of the barrel, is the most effective. A large number of thin ribs were found to be superior to a few ribs of the same total thickness, since this arrangement gives better heat distribution over the head and the barrel.

Between 60 and 85 per cent of the total heat was found to be dissipated from the ring belt in the usual type of piston. The conventional ring belt is about 60 per cent as effective as the piston skirt in dissipating heat with the same temperature difference. It was found that the ring belt should be as short as possible, and that a broad bearing land within the ring belt will improve the heat emission.

The results showed further that piston rings which make good thermal contact with the piston should be used for maximum cooling, and that a gray iron piston head section should be designed for conductivity rather than for strength. Gray iron should be fine grained and homogeneous for thermal conductivity, and low density, low coefficient of expansion, and high coefficient of conductivity should characterize the piston material.

Colony houses for poultry, J. G. Halpin, J. B. Hayes, and J. Swenehart (*Wis. Agr. Col. Ext. Circ. 208 (1926), pp. 8, figs. 3*).—Practical information on the planning and construction of colony houses for poultry adapted to Wisconsin conditions is presented, together with working drawings and bills of material.

Dairy-stable ventilation, F. L. Fairbanks and A. M. Goodman (*N. Y. Agr. Col. (Cornell) Ext. Bul. 151 (1926), pp. 35, figs. 26*).—Practical information on the planning and construction of ventilation systems for dairy stables under the climatic conditions prevailing in the State of New York is presented, together with diagrammatic illustrations and working drawings. Descriptions are given of different systems of dairy stable ventilation, including especially the King and Rutherford and modifications thereof.

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in agricultural economics at the Connecticut Storrs Station, 1926] (*Connecticut Storrs Sta. Bul. 142 (1926), pp. 172–174, fig. 1*).—In addition to the studies previously noted (E. S. R., 54, p. 488; 55, pp. 286, 684), a survey of the Connecticut commercial apple industry shows 600 commercial growers with 200,000 bearing and 90,000 nonbearing trees. Data are given as to the chief varieties of trees, distribution of jobbers' supplies, source of retailers' supplies, and growers' market for apples.

[Investigations in agricultural economics at the Florida Station, 1926], C. V. Noble (*Florida Sta. Rpt. 1926, pp. 95, 96*).—A study made of the 1925 Irish potato crop on 294 farms showed that the average labor incomes—gross receipts less 7 per cent on investment and all farm expenses—besides house and farm products for home use, were $82 for farmers having 15 acres or less in potatoes and $149, $629, $223, $656, and $710, respectively, for farmers having from 16 through 29 acres, 30 through 39, 40 through 49, 50 through 69, and 70 acres and over of potatoes.

[Investigations in agricultural economics and farm management at the Iowa Station, 1926] (*Iowa Sta. Rpt. 1926, pp. 6–8*).—The results are given of work not previously noted (E. S. R., 55, pp. 187, 686).

Growth of mortgage indebtedness on Iowa farms.—The total mortgage indebtedness in 11 townships in 6 counties increased from $453,000 on 7,300 acres in 1915 to $1,385,000 on 12,400 acres in 1923, and then decreased to $1,194,000 on 11,800 acres in 1925, the percentage of land mortgaged being 32, 57, and 57 in the respective years. The number of foreclosures varied from 6 in 1919 to 105 in 1925. The losses of mortgaged land through reversions to mortgagee and voluntary settlement were more numerous than those through foreclosures.

Iowa County cost route.—The first year's work on the cost route in Iowa County shows that on farms with tractors the horses worked approximately 50 per cent more hours during the year than on nontractor farms, the average cost per hour of horse labor being 12.1 cts. on tractor farms and 15.9 cts. on nontractor farms. The use of 2-row cultivators in corn production was found to economize labor and increase man capacity.

[Investigations in agricultural economics at the Kansas Station, 1925–1926] (*Kansas Sta. Bien. Rpt. 1925–26, pp. 18–29*).—The results of investigations not previously noted are reported.

Studies in farm organization and cost of production.—The results of a 5-year study on cost of production in McPherson and Jackson Counties are summarized. Tables are given showing the hours of man and horse labor per acre and acres covered in a 10-hour day in different operations with different sizes and types of equipment in raising wheat in McPherson County and corn in Jackson County. The standard feed requirements for a 1,200-lb. horse working 700 hours in McPherson County and a 1,200- to 1,400-lb. horse working 1,000 hours in Jackson County are included.

The marketing of Kansas wheat.—A tabulation and classification of data obtained by the station for 1922 and 1923 and by the State Board of Agriculture for 1924 for from 251 to 643 farms show that from approximately 10 to 12 per cent of the wheat crop is being marketed earlier than it would be if some farmers were able to obtain credit from local banks.

Data assembled on the cost of operating country elevators for 1920–21, 1921–22, and 1922–23 show that (1) in ordinary years margins and expenses are fairly closely adjusted to each other and permit an average profit of 2 cts. per bushel, although probably one-third of the elevators earn no profits; (2) fixed operating costs, of which salaries and wages constitute about 75 per cent, largely determine what the local buying margin must be; and (3) a knowledge of the milling qualities of wheat and attention to seasonal price trends are important elements in the sales ability of a manager.

Shrinkage and damage in farm storage.—A study was made of all the wheat harvested with combined harvesters on 5 farms near Stafford, Kans., to determine the extent and causes of heating in the bin, the temperatures reached under different conditions, and the extent of the damage as shown by milling and baking tests. Wheat with more than 14 to 14.5 per cent moisture is likely to heat, although wheat with as much as 15 per cent moisture did not heat in protected barn bins. Green wheat with 16 to 17 per cent moisture showed signs of heating and began to cake at the end of 5 days, although the temperature of the wheat was only 86° F., and samples taken showed no inferior baking qualities. Samples taken after 52 days showed a decrease of about 25 per cent in the loaf volume of bread. Samples from heating bins before heating had progressed far showed an increase in loaf volume and no evidence of injury to texture and color. Wheat with 16 to 17 per cent moisture, because of

green berries, caked badly after 10 days' storage and developed extremely high temperatures. Wheat with 14.2 per cent moisture stored with wheat having 16 per cent moisture showed some damage. Wheat containing from 12 to 13.5 per cent moisture remained at a temperature of 95° or above for 5 days without damage.

The economics of the poultry industry on Kansas farms.—A study was made to determine the effect of the size of flocks upon other factors influencing production, the cost of maintaining general farm flocks, changes in the average production for farms in the State, changes in regions of high and low production, distribution of poultry on farms by counties and regions of high or low numbers per farm, and the proportion of total production consumed on the farm.

Flocks of approximately 125 hens were found preferable on average farms, if high production per hen was desired. Feeding 70 lbs. of grain and over per hen gave no better financial results than feeding from 40 to 50 lbs. per hen. Interest charges varied from 7 to 9 cts. per hen, building charges 9 to 12 cts., and expenses $1.50 to $1.80 per hen, the overhead being from 3 to 4 per cent. More than two-thirds of the meat produced was sold. The poultry and eggs averaged 43 per cent of the livestock and livestock products used on the farm, and the value of the portion so used was usually greater than the charges for labor, interest, use of buildings, etc.

The marketing of Kansas livestock and livestock products.—Data were obtained by a questionnaire regarding organization, volume of business, and methods of cooperative livestock selling organizations. Of 98 organizations reporting, 53 had livestock shipping as their principal business, the principal business of most of the others being grain. Of 97 organizations reporting, 75 handled livestock on a commission basis, 8 bought outright, and 14 gave patrons the option of either method. The hundredweight was the basis most commonly used in computing commissions. More than one-half of the organizations used a sinking or insurance fund to cover losses due to crippling or killing in transit. Less than one-third used commercial insurance.

An economic study of the cattle feeding enterprise in Iowa, J. A. Hopkins, Jr. (*Iowa Sta. Bul. 242 (1927), pp. 46, figs. 12*).—This bulletin is divided into 3 parts, as follows: (1) A description of the general development of the beef enterprise in Iowa and the State's place in the beef production of the United States; (2) a study of the factors determining the efficiency and profitableness of fattening cattle; and (3) a condensed statement of the results of a study of cattle prices and the demand for beef.

Records and estimates are given on the physical and financial costs of gains, profits, and similar factors on about 550 lots of feeding cattle in Pottawattamie County during the period 1918–1923. The average cost per pound put on in the lots studied was 16.8 cts. Analysis was made by multiple correlation, using the following factors: The rate of gain per head per day in pounds; cost per pound of gain in cents; grade as expressed as the percentage which the price paid for the feeders was of the general average feeder price in Chicago; finish at sale, the price received expressed as a percentage of the prevailing price of 1,200 to 1,500 lb. steers in Chicago; pounds of crude carbohydrate equivalent in the ration per day; pounds of crude protein per day; pounds of fiber in the ration per day; length of feeding period in days; hours of labor per head per month; number of cattle in the herd; price of corn in cents per bushel; ratio of price of cattle to price of corn; margin received per 100 lbs.; and profit per head.

The price of corn was found to be the largest single influence on the cost per pound of gain, a change from 80 cts. to $1 per bushel increasing the cost per pound nearly 3 cts. A change from 1:15 to 1:14 in the cattle-corn ratio reduced the profit about $2.40 per head. An added margin—difference in price per pound of fattened steers and feeders—of $1 per 100 lbs. on cattle weighing 775 lbs. when purchased was associated with an increased profit of about $1.25 per head. An additional pound of crude fiber per day in the feed decreased the gain about 1/30 lb. per day. Increasing the herd from 1 to 2 carloads saved 8 hours' labor per month per car, decreased the rate of gain about $\frac{1}{10}$ lb. per day per head, and increased the cost of gain about 0.6 ct. per pound. Within reasonable limits, the average cost per pound of gain increased 0.3 ct. for each additional month fed. An increase of ½ lb. per day over the average in the rate of gain resulted in a decrease of about 2.3 cts. in the average cost of gain. Larger rates of gain per day were usually associated with lower costs per pound and higher profits.

A statistical study of the prices and production of beef cattle, J. A. Hopkins, Jr. (*Iowa Sta. Research Bul. 101* (*1926*), *pp. 337–396, figs. 26*).—The principal purpose of this study was to discover how far the cattle producer can depend on the prices of cattle and of related products, and how to interpret them as a guide to production for his own and for the social advantage. The methods used are essentially those of Persons for business conditions.[4]

From 1868 to 1896 the Chicago price of cattle declined 4 cts. per 100 lbs. per year, but the buying power increased at the rate of about 0.5 per cent of the average value per year. From 1896 to 1914 the price of 1,200 to 1,500 lb. steers increased on an average of about 21.5 cts. per 100 lbs. per year, and the buying power increased about 1.1 per cent per year. For the period prior to 1895 the typical seasonal price curve rose from December to the late spring, the peak being at 104.5 per cent in April, May, and June, and the minimum 94.8 per cent in November. After 1895, when corn finishing became much more common, the high point in the prices of 1,200 to 1,500 lb. steers was normally reached in August and September, and the lowest point in February. Much of the seasonal variation, however, was due to variation in the quality of the stock coming on the market at different seasons. From 1866 to 1924 there were 5 major cycles in prices, but they were irregular both as to length and in amplitude, and each seemed to be due to different and unusual forces and conditions.

A study was made of the secular trend, seasonal fluctuations, and cyclical fluctuations in the prices of beef hams, beef carcasses, beef cattle receipts, corn prices, prices of feeder cattle, the feeder margin, hog prices, the prices of 10 sensitive commodities compiled and used by the Harvard Economic Service, and the prices of 12 industrial stocks—the Dow-Jones series—and the correlation of such prices with cattle prices.

The correlation of beef carcass prices with cattle prices showed a strong relationship both with no lag and with a 1-month lag for carcasses. The prices of beef hams lagged 1 to 3 months. Cattle receipts gave a negative correlation, which was decidedly higher when the receipts were correlated with prices at a time 7 months later. The degree of correlation between corn and cattle prices steadily increased as the lag of cattle prices was increased up to 6 months. The size of the coefficients of correlation in the case of feeder and fat cattle prices suggests that fat cattle prices have a greater influence on feeders than feeders on fat cattle prices in following months. The correlation

[4] Persons, W. M. Indices of Business Conditions (pp. 5–107) and Index of General Business Conditions (pp. 111–205). Rev. Econ. Statis., 1 (1919).

coefficients of feeder margins and cattle prices were all positive and were greatest with a 6 to 7 months lag. Hog prices correlated with cattle prices of preceding months gave significant positive coefficients, the correlation increasing until the largest coefficient was obtained with a 5-months lag. Movements of cattle prices were similar to those of the 10 sensitive stocks, although the variations in cattle prices corresponding in time to the variations in the stocks were not always the most outstanding. Cattle prices changed as soon as and often 1 or 2 months prior to the changes in the prices of the sensitive stocks. The prices of industrial stocks moved 2 to 4 months in advance of cattle prices.

Land management, N. I. Koslov (*Zemleustroĭstvo. Moscow: Gosud. Izdatel., 1923, pp. 65+[2], pls. 4*).—The author presents the changes in land ownership since the revolution, the methods adopted by the Soviet Government to increase the productivity of the land, the new laws pertaining to agriculture, and their advantages over the former system of land utilization.

Prices of farm products received by producers.—I, North Atlantic States (*U. S. Dept. Agr., Statis. Bul. 14 (1927), pp. [2]+121, fig. 1*).—Tables are given for Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Pennsylvania showing the monthly farm prices of their leading farm products usually from 1908 or 1910 through 1925; the December 1 farm price of crops, 1866–1925; January 1 farm values of livestock, 1867–1926; value of farm products per unit, by crop-reporting districts, 1924; wages of hired farm labor, 1866–1926; and the value per acre of farm lands, 1912–1926.

Crops and Markets, [March, 1927] (*U. S. Dept. Agr., Crops and Markets, 4 (1927), No. 3, pp. 81–120, figs. 3*).—The usual tables, charts, notes, and summaries are given for cold storage holdings, cotton, other crops, dairy and poultry products, feedstuffs, fruits, vegetables, grain, hay, livestock and livestock products, prices, seeds, and world agriculture. Special articles are included on the farm stocks of grain and merchantable corn in the United States, 1890–1927; planting intentions on March 1, 1927; and the relation of farmers' planting intentions to the agricultural outlook.

The agricultural outlook for 1927 (*U. S. Dept. Agr., Misc. Circ. 101 (1927), pp. 40; Sup., pp. 2+22*).—This fifth annual report was prepared by the staff of the Bureau of Agricultural Economics, assisted by representatives of other bureaus of this Department and of 25 State colleges of agriculture. It is designed to give information as to the probable conditions which will exist when the 1927 farm products are ready for market. The general situation is discussed and conditions as to each important farm product are considered in some detail. A mimeographed supplement gives the principal sources of information on which the report is based.

Agricultural outlook for Oklahoma, 1927, J. T. Sanders et al. (*Oklahoma Sta. Circ. 66 (1927), pp. 16*).—The general conditions in the State and national and international conditions so far as they affect Oklahoma agricultural conditions are analyzed, with a view to furnishing Oklahoma farmers information as to the most probable future trends of demand and supply for the important agricultural products of the State.

Texas agricultural outlook for 1927, L. P. Gabbard (*Texas Sta. Circ. 45 (1927), pp. 16*).—The national agricultural outlook for 1927 (see above) for the major crops and livestock enterprises is interpreted in terms of Texas agriculture.

Agriculture in Finland (*Suomen Maatalous Kuvioin ja Kartoin. Finlands Lantbruk i Diagramm och Kartor. L'Agriculture de la Finlande en Diagrammes*

et Cartes. Porvoo (Borgå): Werner Söderström Osakeyhtiö, 1925, pp. 164, figs. 317).—An agricultural atlas in Finnish, Swedish, and French.

Cooperation in agriculture: A selected and annotated reading list, compiled by C. GARDNER (*U. S. Dept. Agr., Misc. Circ. 97 (1927), pp. 76*).—A selected and annotated reading list of works printed in English, with special reference to purchasing, marketing, and credit. A classified list by subjects and countries and a list of periodicals are included.

Co-operative democracy, J. P. WARBASSE (*New York: Macmillan Co., 1927, 2. ed., rev., pp. XIV+331*).—This is the second edition of this work, previously noted (E. S. R., 50, p. 92).

Studies in European co-operation, [I], II, C. F. STRICKLAND (*Lahore, Punjab: Govt., 1922 [vol. 1], pp. [7]+166+V; 1925, vol. 2, pp. [5]+182+LXXX+IX*).—Volume 1 is a report of a four months' visit in 1920 to Holland, Belgium, Italy, and England to study European cooperation, and volume 2 is a report of a study made in 1924 in the British Isles, Denmark, Norway, Sweden, and Egypt of land mortgage banks, credit and cooperation, dairying, consolidation of holdings, colonization and small holdings, and adult education. The subjects are discussed and conclusions reached with the requirements of India, and especially Punjab, in mind. Appendixes to volume 2 include a translation of the Punjab 5-feddan law; the Danish law of June 20, 1850, concerning credit associations and loan banks; the by-laws of five Indian mortgage banks; the Agricultural Credits Act of 1923 of England; and the Egyptian law (Law No. 27) regulating agricultural cooperative societies in Egypt.

[Report of the International Country Life Commission] (*Bul. Comn. Internatl. Embell. Vie Rurale, 1926, Nos. 1, pp. 44; 2, pp. 144; 3, pp. XVIII+152*).—Bulletin 1 contains the various reports of the proceedings, the president's address, and the following reports made at the first meeting held at Brussels July 19, 1925: The Use of Electricity in Rural Sections, by Baron Forgeur; Present and Possible Methods for Checking Rural Exodus, by Baron de Cartier d'Yve; Improvement of Country Life in Hungary, by Weis; and The Rural Welfare Movement, by A. Prokes.

Bulletin 2 includes the following papers, reports, and addresses: The Commission for the Improvement of Country Life, by F. Graftiau; Belgian National Commission for the Improvement of Country Life, by J. Giele; The Country Life Movement in the United States, by C. J. Galpin; The Social Activities of the Farm and Village, by D. Sanderson; Rural Life Improvement Activities of the International Institute of Agriculture, by A. Hobson; the Farm Home in the United States of America, by G. E. Frysinger; the Rôle of the Family Life in the Country, by Mrs. Bednarikova-Voprsalova; Improvement of Rural Life in Hungary, by Schandl and Weis; The Rôle of the Social Life in the Country, by J. Voprsal; The Importance of the Home in the Improvement of Country Life, by A. M. DeVuyst; The School and Country Life, by J. Herbé; Rôle the School Played in the Embellishment of Country Life, by V. Smetanka; Training Girls to be Leaders in Rural Life, by St. Nihal Singh; A School for the Preparation of Young Girls for the Improvement of Rural Social Life, by De Vuyst; The Importance of Women's Institutes in the Improvement of Country Life, by Baroness de Crombrugghe de Picquendaele; The United Irishwomen; Guild for Rural Clubs in Ireland; Some Social Aspects of Cooperative Marketing in the United States, by F. B. Bomberger; Competition Between Villages in the Province of Brabant (Belgium), by J. Lindemans; The Problem of the Moral Improvement of Mankind, by P. DeVuyst; The Beautifying of Villages in Poland, by E. Janowski; and A Plan for a Manual on Village Life, by J. Lindemans.

Bulletin 3 contains various lists of the program, reports, etc.; reports upon country life work in Holland, the Finish "Martha" Association, the Association of the Societies of Professional Gardeners of Poznan, Poland, and the arrangement of intermediate and primary instruction for girls to overcome the tendency to leave the village; and A Proposed Program for the Formation of a Rural Community of Interest to All Countries, by K. L. Butterfield.

Most of the papers, etc., are printed in both English and French.

Farm population of the United States, L. E. TRUESDELL (*U. S. Bur. of the Census, Census Monog. 6 (1926), pp. XI+536, figs. 17*).—An analysis of the 1920 farm population figures, especially in comparison with urban data, and a study of the main economic factors affecting the farm population. It contains a general survey and chapters and tables on rural and urban population from 1790 to 1920; composition and distribution of farm population; number and distribution of farm, village, and urban population by sex, age, race, nationality, and parentage; and agricultural occupations. A special chapter and tables are given on the composition, characteristics, and occupations of the farm population of Otsego County, N. Y.; Dane County, Wis.; New Madrid and Scott Counties, Mo.; Cass County, N. Dak.; Wake County, N. C.; Ellis County, Tex.; and King County, Wash. This chapter and tables are based on a special tabulation of the census schedules made by the Bureau of Agricultural Economics, U. S. D. A.

Rural social agencies in northern Illinois, M. L. WHITTAKER (*North. Ill. State Teachers Col. Quart., 20 (1925), No. 2, pp. 36, pls. 11*).—A study of the rural social agencies in the 25 northern counties of Illinois was made in cooperation with the U. S. Department of Agriculture. Thirteen typical agencies are described.

Some town-country relations in Union County, Ohio, P. P. DENUNE (*Ohio State Univ. Studies, Sociol. Ser. No. 1 (1924), pp. 30, fig. 1*).—A field study was made during July to September, 1923, of the church, school, lodge, recreation, amusement, social, and economic relations of the town and country population of Union County, Ohio, to discover the underlying attitudes of mind affecting these relationships and the modes of expressing these attitudes. The population of the county was strictly rural, there being only 2 towns with more than 1,000 population besides the county seat, which had a population of 3,633 in 1920.

No social distinctions or cleavage were found to exist between townspeople and farmers. Cooperation and mutual interest existed in such matters as schools, public entertainments, etc. In economic problems and business practices, however, the only tendency away from an individualistic attitude was seen in the development of certain cooperative enterprises among the farmers under the influence of the farm bureau federation.

Methods of conducting family budget enquiries, J. H. RICHARDSON (*Internatl. Labor Off., Geneva, Studies and Rpts., Ser. N, No. 9 (1926), pp. 100*).—This study is one of a series being made by the International Labor Office of the methods adopted in various countries with regard to different kinds of labor statistics. The collection of information is discussed under the heads of selection of the families, duration of inquiry, and methods of securing the budgets; the scope of information under the heads of general conditions, income, and expenditure; and the compilation of results under classification, income, expenditure, and methods of reducing data for different-sized families to terms of a common unit.

Appendixes contain notes on the scope and methods used in obtaining information and compiling results in the more important family budget inquiries

conducted by the government or local administrative authorities in different countries since 1900 and specimens of the forms used in the various inquiries.

Social work a family builder, H. Townsend (*Philadelphia and London: W. B. Saunders Co., 1926, pp. 247*).—A textbook for nurses, dietitians, home demonstration agents, home economists, and special teachers, written to furnish an understanding of the principles of social work in behalf of families and individuals. It consists of chapters on the reason for and backgrounds of social work, social work and social progress, the ancient and modern in present-day practice, origins, and continuities of the family, the immigrant and the American family in a changing world, the family standard of living, the scientific approach to a problem, diagnosis and treatment of a family problem, and family social work under public or private auspices.

A list of topics for discussion, subjects for reports, references, and suggested reading is given for each chapter.

Statistics of hogs, pork, and pork products (*U. S. Dept. Agr., Statis. Bul. 18 (1927), pp. 208*).—Tables are given for the year 1925 with comparable data for earlier years, showing for hogs the number on farms, breeds, changes in numbers, pig surveys, and losses from disease, the receipts, shipments, slaughter, condemnations, weights, and costs at the leading markets of the United States, exports, costs of marketing, farm value by States, monthly prices by States, and prices at the principal markets; and for pork and pork products the production, consumption, receipts, supply, exports and imports, cold-storage holdings, and monthly and weekly prices at principal markets.

Statistics relative to the dairy industry in New York State, 1925 (*N. Y. State Dept. Farms and Markets, Agr. Bul. 192 (1926), pp. 71, figs. 7*).—Statistics as to dairy cattle, milk production, dairy products, bovine tuberculosis eradication, milk plants, etc., are given. The bulletin was prepared in cooperation with the Bureau of Agricultural Economics, U. S. D. A.

First annual report upon the agricultural statistics of Northern Ireland, 1925 (*North. Ireland Agr. Statis. Ann. Rpt., 1 (1925), pp. 78, fig. 1*).—The first detailed annual report upon the agricultural statistics of Northern Ireland. Tables and texts are included covering the revision of the statistics for 1919–1922, division of land during the years 1914–1925, the tillage campaign of 1914–1918, decline in plowed area in 1919–1925, yield of crops, livestock forestry, agricultural holdings, employment in agriculture, and prices of livestock and other agricultural products.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

The farm, E. Davenport (*New York: Macmillan Co., 1927, pp. XIX+462, pls. 16*).—This book is a "discussion of the partnership between the farmer and his farm." The 38 chapters are divided into 3 parts, (1) what nature has provided to make farming possible (pp. 2–225); (2) farm operations (pp. 227–395; and (3) the farm in trust (pp. 397–443).

Horticulture, H. P. Stuckey and C. D. Mathews (*Atlanta, Ga.: Smith, Hammond & Co., 1926, pp. X+717, pl. 1, figs. 224*).—This text is designed primarily for the use of vocational agricultural classes.

Laboratory outlines in plant pathology, H. H. Whetzel, L. R. Hesler, C. T. Gregory, and W. H. Rankin (*Philadelphia and London: W. B. Saunders Co., 1925, 2. ed., rev. and rewritten, pp. 231, fig. 1*).—This second edition (E. S. R., 38, p. 540) has been completely revised and rewritten by the senior author. These outlines, intended primarily for use by persons taking a regular 4-year course at Cornell University, are planned to acquaint students effectively

with the material here presented as the result of experience and testing in actual practice work. Although changes in arrangement and terminology appear, the general character of the outlines remains the same.

Laboratory practice in the methods of control of the diseases studied is reserved for the course following this on the principles of plant-disease control.

Productive poultry husbandry, H. R. LEWIS (*Philadelphia and London: J. B. Lippincott Co., 1926, 6. ed., rev., pp. XXII+584, pls. 2, figs. 240*).—The sixth edition of this book previously noted (E. S. R., 46, p. 95).

Training unadjusted boys as farmers, E. P. BRADT (*Sci. Agr., 7 (1927), No. 8, pp. 306–308, figs. 2*).—The article briefly describes the plan of the Boys' Training School at Bowmanville, Ont. Most of the boys in residence are city bred and reared. Boys from 10 to 13 years old spend practically all of their time in academic school work, and are compelled to spend a certain amount of time in each of the four departments—metal working, motor mechanics, woodworking, and agriculture. Older boys are apprenticed to the department they prefer or for which they show the greatest aptitude, and receive small pay. Boys in the agricultural department during the first year of apprenticeship receive instruction and practice in general farm and barn work, and the second year they may specialize in such courses as poultry, dairying, or gardening.

A forestry program for women's organizations, L. T. CONWAY (*U. S. Dept. Agr., Misc. Circ. 91 (1927), pp. II+14, figs. 5*).—A collection of talks, readings, poems, and quotations.

FOODS—HUMAN NUTRITION

Studies on the refrigeration of meat, I, II (*Aust. Jour. Expt. Biol. and Med. Sci., 3 (1926), Nos. 1, pp. 15–31, pls. 3, fig. 1; 2, pp. 81–88, fig. 1*).—Two papers are presented.

I. *Investigations into the refrigeration of beef,* G. A. Cook, E. F. J. Love, J. R. Vickery, and W. J. Young.—The "drip" or exudation of protein-containing liquid from cut surfaces after the freezing and thawing of beef was studied by freezing samples at various rates, from a slow freezing of large pieces to an almost instantaneous freezing of thinner slabs with liquid air, the thawing being similarly varied. Drip was estimated by placing uniform samples under light pressure on blotting paper for 2 hours, the result of a blank run on the unfrozen meat being subtracted from the loss in weight due to the drip of the frozen-thawed samples. Total nitrogen was determined on the paper-absorbed drip. Histological examination was made (1) in still frozen sections of the frozen meat and (2) in sections cut from material fixed in 10 per cent formalin and stained in haematoxylin and eosin. Comparative rates of autolysis were studied by incubation at 35° C., followed by precipitation with tannic acid, and determination of nonprecipitable nitrogen.

Long latent periods of freezing and short thawing periods increased drip, nitrogen loss on thawing, histological alteration, and both rate and extent of autolysis. Very rapid freezing, with slow thawing or prolonged storage at 1° so far reduced the drip and other evidence of alteration as to give almost perfect reconstitution. This is probably due to a lessening of the separation of water from the colloids. Mutton showed less ice formation and structural distortion than did beef under the same conditions.

II. *The freezing of beef and mutton press juices,* J. R. Vickery.—Centrifuged clear juices pressed from beef and mutton about 48 hours after rigor mortis had passed off were frozen in uniform glass cylinders with arrangements to

secure various rates of freezing, temperature changes being followed by means of thermocouples, set in stoppers to prevent evaporation during storage of the frozen juice. The effect of the rate of thawing was also studied, from very rapid to very slow thawing. Determinations before and after freezing and thawing of nitrogen not precipitated by centrifuging showed a fairly complete reconstitution of beef and mutton juices when frozen with latent periods of 3 hours or less, the results being better with slow thawing. The ultramicroscope, however, showed much fewer colloidal particles after freezing and thawing of beef juice, the reduction decreasing with an increase in the rate of freezing. Mutton juice showed little difference in number of particles after freezing and thawing, and variation from 0.3 to 3 hours in freezing time had little effect. These results are tentatively attributed to alterations brought about by freezing in the muscle sarcolemma.

Bacteriology of meat curing (*Iowa Sta. Rpt. 1926, pp. 28, 29*).—This is a brief progress report on a study of the microbiological and physicochemical principles involved in the curing of meat products as determined by curing small chunks of pork under known conditions. "Color, texture, taste and rate of cure have been found to be governed by the bacterial flora, hydrogen ion concentration, other ion effects, temperature of cure, and condition of meat at time of cure." The formation of color during curing was found to be a function not only of the nitrite ions but of the concentration of salt. Nitrites proved effective in a concentration of from 1/10 to 1/20 that of the nitrates generally used, but a desirable color was not produced until the concentration of salt was increased to at least 10 per cent. The presence of calcium and magnesium in the water used in curing had no noticeable effect upon color formation, taste, or texture of the cured product.

Selection and use of bacon, A. M. CHILD (*Minnesota Sta. Bul. 232 (1926), pp. 19, figs. 5*).—This bulletin, which is based largely on experimental work conducted by the author, contains useful information for the housewife on the selection of bacon with regard to quality and comparative costs of different types, the most economical and satisfactory ways of cooking bacon with standards for judging the finished product, and recipes for the use of bacon fat as a shortening agent and of bacon in unusual breakfast and luncheon dishes.

Studies on dietary value of meat (*Iowa Sta. Rpt. 1926, pp. 35, 36*).—In the preliminary experiments reported rats were carried through two and in a few cases three generations on meat and vegetable rations having certain mineral, vitamin, and protein deficiencies and on rations consisting of all meat; meat, liver, and bone; meat and bone; a well-balanced food mixture; and vegetables with milk products.

While admitting that the experiment should be continued through several more generations for the results to be conclusive, the results obtained tend to show: "(1) That a high meat diet is apparently not harmful over the periods of time covered by this experiment. (2) That the dilution of such a diet with carbohydrates (dextrinized) apparently does not help it. (3) That calcium is necessary in liberal quantities, but a meat and bone meal diet needs added vitamins to make it optimum. Liver seems to supply this deficiency. (4) That the addition of meat to a diet, provided enough vitamins and mineral salts are present, speeds up growth and reproduction, and makes for an optimum rearing of young."

Manual for the manufacturer of preserved food—fruits and vegetables, G. RAY (*Manuel du Fabricant de Conserves (Conserves de Fruits—Conserves de Légumes)*). *Paris: J. B. Baillière & Sons, 1926, pp. VI+7–376, figs. 168*).—Included in this handbook on methods of preserving foods by heat, refrigeration,

dehydration, the addition of antiseptics, and the occlusion of air are various French laws corresponding to the United States Food and Drugs Act.

Canning of non-acid vegetables, O. D. ABBOTT (*Florida Sta. Rpt. 1926, p. 99*).—In attempts to determine the causes of frequent spoilage in nonacid vegetables canned in Florida peas and corn were canned by the hot-pack method for 3 hours in a water bath and at 10 lbs. pressure for 50 minutes.

Thus far the peas canned by either method have spoiled and the corn has not. It is suggested that the difference may be due to the methods of packing the jars. The corn was packed very loosely in the jars which were then filled with hot water. This is thought to make possible rapid penetration of heat to the center of the jars, while in jars packed tightly the temperature in the center may not be high enough to kill the spores.

Some factors that influence jellying, O. D. ABBOTT (*Florida Sta. Rpt. 1926, pp. 98, 99*).—Attempts to prepare a standard jelly from kumquats were unsuccessful, although the pectin content, 1.688 per cent, and the H-ion concentration, pH 2.9, were such as to lead one to expect that good jellies could be made from the fruit. It is suggested that the failure may be due to the predominating acid and salt content.

The vitamin content of some common fruits and vegetables (*Kansas Sta. Bien. Rpt. 1925–26, pp. 128, 129*).—In this preliminary report the results obtained in a study of the vitamin C content of raw and canned pears are summarized as follows:

"The minimum protective amount of raw pear is about 10 gm. daily, although this amount is not sufficient to provide for good growth. Larger amounts gave better growth, while 30 and 35 gm. gave better growth than 5 cc. of tomato juice. The antiscorbutic factor of pear is destroyed in canning by either the 'cold pack' or 'open kettle' method. Storing pears under refrigeration seemed not to affect their antiscorbutic content. The substitution of California for home-grown pears did not affect the growth curve of the experimental animals."

The place of the banana in the diet, W. H. EDDY and M. KELLOGG (*Amer. Jour. Pub. Health, 17 (1927), No. 1, pp. 27–35, figs. 5*).—This paper includes a more detailed report of the study of the vitamin content of the banana, noted in a preliminary report (E. S. R., 55, p. 293), and a review of the literature on its nutritive value and digestibility.

The preliminary data on the content of vitamins A and C in the ripe banana are confirmed, and in addition it is stated that bananas baked in the skin retain their antiscorbutic properties better than when baked without the skin, probably on account of the protective action of the skin in the prevention of oxidation. A cure is reported of a case of scurvy in an 8-months-old baby by a banana-milk mixture made by whipping 200 gm. of ripe raw banana into 570 cc. of milk. The mixture was fed in 120 cc. portions every 4 hours with no resulting digestive disturbances.

The vitamin B value of ripe raw bananas is reported to be about that of tomato juice as tested by the method of Sherman and Grose (E. S. R., 51, p. 461), from 8 to 10 gm. daily being required. Difficulties in getting the rats to eat enough of the basal diet with the large amount of banana necessary were overcome by subtracting from the basal diet the amount of the carbohydrate furnished by the banana.

No evidence was obtained as to the presence of vitamin D in bananas when substituted for flour in the Sherman-Pappenheimer diet 84 in amounts as high as 15 per cent.

A bibliography of 25 titles is appended.

Malt and malt extract as sources of vitamin B and C [trans. title], L. RANDOIN and R. LECOQ (*Bul. Soc. Chim. Biol., 9 (1927), No. 1, pp. 49–58,*

figs. 7).—Using the basal diets previously described for vitamin C (E. S. R., 50, p. 166) and for vitamin B with rats (E. S. R., 53, p. 265) and with pigeons (E. S. R., 56, p. 393), the authors have found both dried malt and malt extract to be completely lacking in vitamin C and malt extract to contain vitamin B as determined with either rats or pigeons. In the rat experiments the malt extract replaced the sucrose which had comprised 68 per cent of the basal diet, and in the pigeon experiments it replaced the dextrin to the extent of 66 per cent of the diet.

The alleged therapeutic value of the malt extract for human scurvy is attributed to the probability that patients responding favorably to it are really suffering from a deficiency of vitamin B as well as C, and are partially cured through the richness of the extract in vitamin B.

Vitamin B [trans. title], L. SCOTTI-FOGLIENI (*Arch. Ital. Biol., 75 (1925), pp. 183–185*).—The author heated a suspension of rice bran in water in an autoclave at temperatures of 100, 110, 120, and 134° C., respectively, and then allowed the vapor to pass through a serpentine condenser instead of escaping into the air. This condensate and the liquid obtained by filtering the mixture in the autoclave were tested alone and combined on polyneuritic pigeons. Only slight evidences of curative properties were noted for any of the preparations tested alone, but when combined (distillate and filtrate for each temperature) the curative effect was prompt and marked.

These results are considered to indicate that vitamin B is composed of two substances which are not active separately but only when combined. The nonvolatile fraction gives positive, and the volatile fraction negative, tests with the Folin-Macallum phosphotungstic acid reagent.

The content of antiberiberi vitamin in some vitamin patent foods [trans. title], E. KOMM (*Ztschr. Untersuch. Lebensmtl., 52 (1926), No. 4, pp. 303–307, figs. 6*).—This report of a study of the vitamin B content of various German proprietary foods is of interest in that the method of testing consisted in feeding pigeons polished rice until a marked fall in body temperature occurred and noting whether the administration of the material being tested was followed by a prompt rise in temperature. Temperature and weight curves are given showing that the temperature response is more rapid than the weight response following the ingestion of materials containing vitamin B.

The newest vitamin, W. P. KENNEDY (*Sci. Prog. [London], 21 (1927), No. 84, pp. 659–664*).—A review and discussion of the literature on vitamin E.

Practical dietetics with reference to diet in health and disease, A. F. PATTEE (*Mount Vernon, N. Y.: Author, 1927, 16. ed., pp. XV+1–676, figs. 9*).—A revision of the volume previously noted (E. S. R., 55, p. 590).

Preventive medicine and hygiene, M. J. ROSENAU (*New York and London: D. Appleton & Co., 1927, 5. ed., pp. XXV+1458, pl. 1, figs. 157*).—A revision of the volume previously noted (E. S. R., 46, p. 859).

Special diets made Kosher, S. K. DAVIS (*Western Dietitian, 2 (1927), No. 6, pp. 17, 20, 21*).—This general discussion of the problems involved in preparing special diets conforming to Jewish dietary laws is supplemented by diabetic, gastric hyperacidity, and roughage diets adapted to traditional Passover customs.

The use of high fat diets for constipation, F. H. SMITH (*Jour. Amer. Med. Assoc., 88 (1927), No. 9, pp. 628, 629*).—This contribution from the department of nutrition, St. Mary's Hospital, Rochester, Minn., describes exceptionally favorable results obtained in obstinate cases of constipation by the use of diets containing a large amount, 225 gm. daily, of fat. It is stated that from 3 to 4 days are required to establish normal bowel habits on the high-fat diet.

Utilization of calcium and phosphorus from fresh, dried, and canned milk (*Kansas Sta. Bien. Rpt. 1925–26, pp. 129, 130*).—Four adults and 5 children (3 girls and 2 boys between 7 and 12 years of age) served as subjects in the calcium metabolism studies which are reported briefly. Simple diets were used in which as large a proportion as possible of the calcium was furnished by milk in amounts less than the optimum level. In the work with children, fresh milk was used during the first, second, and seventh periods of 3 days each; powdered milk during the third and fourth periods; and unsweetened condensed milk during the fifth and sixth periods. In the work with adults fresh milk from the college herd was used during the third and fourth periods, fresh milk from two cows kept in the barn and deprived of sunlight for more than 4 months the seventh and eighth periods, powdered whole milk the first and second, and unsweetened condensed milk the fifth and sixth periods.

In the experiments with children the fresh and dried milk furnished not less than 75 per cent, and the condensed milk not less than 63 per cent, of the total calcium. The retention of the calcium per kilogram was only from 50 to 75 per cent as much on the dried, and less than 50 per cent as much on the condensed milk as on the fresh. With the adults the milk furnished abont half the total calcium. In the dried milk periods the retention was much less than in the fresh herd milk periods. Two of the 4 subjects showed poorer utilization and 2 as good on the condensed milk as on the fresh. Two subjects only were on the diet when the fresh milk used came from cows which had been kept away from sunlight. Both showed a lowered utilization than on the other fresh milk and about the same as on the dried milk.

The general trend for phosphorus was about the same as for calcium, although the results were not as conclusive.

A note on the calcium content of the serum of normal adults, I. Rosen and F. Krasnow (*Jour. Lab. and Clin. Med., 12 (1926), No. 2, pp. 157, 158*).—Determinations by the Kramer-Tisdall method (E. S. R., 46, p. 203) of the calcium content of the blood sera of 50 medical students are reported with minimum, maximum, and average values of 10.7, 13.2, and 11.6 mg. per 100 cc. Attention is called to the fact that the values are definitely higher than the values usually accepted as normal (9 to 11 mg. per 100 cc.). In the present series 91 per cent of the values were between 11 and 12.9, and only 7 per cent less than 11 mg. per. 100 cc.

Coefficient of digestibility and dynamic action of a simple diet in contrasting types of individuals, J. Whitacre and K. Blunt (*Jour. Home Econ., 19 (1927), No. 1, pp. 20–27*).—To determine whether variations in food demands of different people of similar body build and apparent activity are attributable to individual differences in the specific dynamic action or digestibility of food for different temperamental types, five graduate students of home economics at the University of Chicago, three belonging to the nervous, vivacious type and two to the calm, phlegmatic type, served as subjects in 6-day metabolism experiments on a simple mixed diet. The senior author served as subject three times and the other four once each. The diet selected was thought to be adequate in all respects and furnished from 2,224 to 2,532 calories per person daily, with a percentage distribution of protein 13, fat 40, and carbohydrate 47 per cent. The data obtained included the coefficient of digestibility of the protein, fat, and carbohydrate, the basal energy metabolism and percentage of increase after meals, and the basal pulse rate and the pulse rate after meals.

The coefficients of digestibility were strikingly similar, showing no correlation with the type of individual. The height of elevation of the oxygen consumption over the basal was not appreciably different for the two types, and the stimulation was even less prolonged in the vivacious than in the placid-type subject.

It is concluded that a lower dynamic action of the food and higher coefficient of digestibility can not account for the easy gain of overweight and placid persons. A list of 17 references to the literature is included.

Nutritional survey, O. D. ABBOTT (*Florida Sta. Rpt. 1926, p. 98*).—A preliminary survey by G. Westover of the nutritional status of 500 rural school children of two counties in Florida has shown that 50 per cent of the children examined were from 5 to 33 per cent under weight, 48 per cent had defective teeth, and 33 per cent enlarged tonsils. Further examination showed conjunctivitis, skin eruptions, anemia, and hookworm to be prevalent.

Increase in stature of American boys in the last fifty years, H. GRAY (*Jour. Amer. Med. Assoc., 88 (1927), No. 12, p. 908, fig. 1*).—The author has compared his height-age data for private-school boys (E. S. R., 56, p. 394) with similar data reported 50 years ago by Bowditch. The latter data consisted of two series of measurements, one for sons of American-born fathers in various professions and the other for 303 Boston boys of American parentage attending the Private Latin School, the Massachusetts Institute of Technology, and the Public Latin School. The average height of the boys measured by Gray exceeded the first series of Bowditch by 7.9 cm. (3.1 in.) and the second series by 6.5 cm.

A study of the effect of nutrition on mental growth, A. J. SMITH and A. M. FIELD (*Jour. Home Econ., 18 (1926), No. 12, pp. 686–690*).—This study was conducted in the fourth, fifth, and sixth grades of a public school in Alabama, the subjects comprising 37 girls and 24 boys. The children were divided into two gronps according to weight. Those who were 7 per cent or more underweight for height and age by the Baldwin-Wood tables comprised the underweight or experimental group, consisting of 19 girls and 6 boys, and the other 18 boys and 18 girls, the normal or control group. The underweight children were examined by a physician, who found all of the boys and all but 5 of the girls to have some physical defects, but these were not corrected during the period of the experiment, which lasted 5 months. During this time special attention was paid to the dietary habits of the underweight group, school lunches being provided to supplement the home diet. The National Intelligence Tests, Scale A, were given to all of the children, form 1 at the beginning and form 2 at the end of the period. The physical gains were measured by the gains in weight during the period.

Both control and experimental groups of girls exceeded the expected gain in weight, while both groups of boys fell below it. The average gain of the control group was the same as the expected gain, and that of the experimental group exceeded the expected gain. In mental age the greatest gain, 14.1 months, was made by the control boys, followed by a gain of 13.5 months by the control girls. The corresponding gains for the experimental groups were 9.8 and 9.2 months, respectively. The gain in intelligence quotient for the control group, 6.3, was more than twice that of the underweight group.

"While this study was of too short duration and with too few subjects to be conclusive, it would indicate that the assumption that improved nutrition, as measured by gain in weight, will bring about improved mentality is at least not yet proved."

Review of literature on the physiological effects of abnormal temperatures and humidities, R. R. SAYERS and S. J. DAVENPORT (*Pub. Health Rpts. [U. S.], 42 (1927), No. 14, pp. 933–996, fig. 1*).—Included in this extensive literature review is a discussion of the kind of clothing which should be worn to prevent the ill effects of subjection to extremes of temperature, either climatic or industrial. A list of 189 literature references on the general subject of the physiological effects of abnormal atmospheric conditions is appended.

TEXTILES AND CLOTHING

The dyeing of cotton and artificial silk fibres, A. J. Hall (*Chem. Age [London], 16 (1927), No. 402, pp. 19–21, fig. 1*).—Attention is called to peculiarities of the dyeing properties of treated cellulosic fibers, with comment on their importance to the dyeing industry.

The influence of humidity on the elastic properties of cotton.—III, On the breaking load at 20° C., J. C. Mann (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 6 (1927), No. 4, pp. 53–64, figs. 11*).—Tests involving six varieties of cotton showed that the strength of single fibers increases with rise in humidity, the increase being of the order 10 to 15 per cent of the breaking load at 44 per cent relative humidity. The effect of humidity is important up to 66 per cent relative humidity but negligible above 66 per cent. The test methods are detailed.

Physical tests to determine the effects of chemical or other treatments on yarns, C. F. Goldthwait (*Amer. Dyestuff Rptr., Sample Swatch Quart., 1927, Jan., pp. 7–14, figs. 19*).—The tests described are concerned with the length of a yarn sample, correction for weight of yarn, and elastic properties of yarns.

Processes for rendering woolen goods unshrinkable, A. J. Hall (*Textile Colorist, 49 (1927), No. 579, pp. 161–164, figs. 5*).—Recent investigations on the chlorination of wool are reviewed.

Annual wool review, 1926, J. B. McPherson (*Bul. Natl. Assoc. Wool Manfrs., 57 (1927), Extra No. 1, pp. 99–226, pls. 2*).—The information recorded is similar in scope to that noted previously (E. S. R., 55, p. 195).

A directory of textile merchandise, including textile brands and trade-marks, compiled by **Textile World** (*New York: Bragdon, Lord & Nagle Co., 1921, 2. ed., pp. 15–630*).—This directory supplies a list of trade names, brands, and trade-marks of products of which textile fibers, yarns, or cloth are the principal materials, the kinds of goods to which the names apply, and the first-hand distributors. Brands are also classified according to product. A discussion on Valid Trade Marks and Their Originations, by H. C. Thomson, is included.

The protective value of certain clothing fabrics (*Kansas Sta. Bien. Rpt. 1925–26, pp. 131, 132*).—Samples of white wool, silk, linen, and cotton materials as closely alike as possible in weave were tested for their screening effect against sunburn (1) by the action of direct sunlight on the skin, (2) by the action of ultra-violet light on sensitized paper, (3) by photometric measurements, and (4) by spectrographic analysis.

The results obtained with direct sunlight and spectrographic analysis were identical and indicated a much greater protection with wool and silk than with cotton or linen. This relation was also shown, but to a less marked extent, by the ultra-violet light measurements. The percentage of interspace for the different fabrics was 8.8 for wool, 12 for silk, 5.5 for linen, and 5.8 for cotton.

"The data tend to show that the protection from sunburn afforded the skin by fabrics depends principally upon the percentage of interspace due to weave. The vegetable fibers, cotton and linen, however, transmit some of the rays that burn and hence have a small coefficient of protection. Animal fibers, silk and wool, on the other hand, absorb a portion of the rays, thus having a large coefficient of protection."

Smoke: A destroyer of family wash, R. A. Phair and J. G. Lukash (*Starchroom Laundry Jour., 34 (1927), No. 4, pp. 37–42, figs. 3*).—The type of damage described as occurring in cotton fabrics, especially shirts, in "wet

wash" or home washed clothes only in winter, principally during January, February, and March, appeared to be caused by the presence of minute quantities of sulfuric acid in the air. The destruction and acid content of the fabric appeared to increase under conditions of cold and fog. See also a previous report by Allyn (E. S. R., 56, p. 595).

MISCELLANEOUS

The Thirty-ninth Annual Report of the Colorado Agricultural Experiment Station for the Year 1926, C. P. GILLETTE ET AL. (*Colorado Sta. Rpt. 1926, pp. 46*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1926, a report of the director on the work of the station, and departmental reports. The experimental work reported is for the most part abstracted elsewhere in this issue.

Report of the director [of Connecticut Storrs Station], 1926, W. L. SLATE, JR. (*Connecticut Storrs Sta. Bul. 142* (*1926*), *pp. 165–182, figs. 7*).—This contains the organization list, a report of the director, and a financial statement for the fiscal year ended June 30, 1926. The experimental work reported is for the most part abstracted elsewhere in this issue.

[Annual Report of Florida Station, 1926], W. NEWELL ET AL. (*Florida Sta. Rpt. 1926, pp. 125+VI, figs. 10*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1926, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue.

Annual Report [of Iowa Station], 1926, C. F. CURTISS and W. H. STEVENSON (*Iowa Sta. Rpt. 1926, pp. 63*).—This contains a report on the work of the station, including a financial statement for the fiscal year ended June 30, 1926. The experimental work recorded not previously noted is for the most part abstracted elsewhere in this issue.

[Report of Kansas Station, 1925–1926], L. E. CALL (*Kansas Sta. Bien. Rpt. 1925–26, pp. 162*).—This contains the organization list, financial statements for the biennium ended June 30, 1926, and a report of the director summarizing the work and publications of the station. The experimental work recorded not previously noted is for the most part abstracted elsewhere in this issue.

Michigan Agricultural Experiment Station Quarterly Bulletin, [February, 1927], edited by R. S. SHAW and E. B. HILL (*Michigan Sta. Quart. Bul., 9* (*1927*), *No. 3, pp. 81–126, figs. 4*).—In addition to articles abstracted elsewhere in this issue, this number contains the following: Power Possibilities of Small Streams, by O. E. Robey; Grow Better Potatoes, by H. C. Moore; Preparing and Fertilizing Potato Soils, by F. W. Trull; Methods Recommended for Increasing Oat and Barley Yields, by G. R. Schlubatis; Soil Preparation and Fertilization for Corn, by C. E. Millar; and Position on Ridge Affects Conifers Growth, by A. K. Chittenden and W. Martin.

NOTES

Florida Station.—In continuing the studies on Manson's eye worm of poultry noted on page 874, many insects were examined without finding any laval forms of the parasite, until finally specimens of *Pycnoscelus surinamensis* Linn., a species of cockroach, were examined. Larvae of the eye worm were found to be present in the thoracic and abdominal cavities of some of these roaches. When these larvae were transferred to the eyes of chickens, examinations several days later revealed that the larvae remained in the eyes of the birds and had taken position in the tear sac beneath the nictitating membranes in each bird identical to that in which mature parasites are found. Larvae were also removed from the body of a cockroach and placed one at a time on the roof of the mouth and on the tongue of a chicken, with the result that in a few hours the presence of the parasite was noted in both eyes.

These observations confirm the findings of J. W. Fielding (noted on page 879) that this species of roach is the intermediate host for Manson's eye worm.

Hawaii University.—Dr. Frederick G. Krauss, professor of agronomy and genetics, has been given leave of absence for an extended study of tropical plants, especially the pineapple in the Dutch East Indies and Malaya, and of Cajanus in the Himalayan region. He will then proceed to Berlin for the Fifth International Congress of Genetics in September and a year's genetics study in Germany.

Kansas College and Station.—The vacancy occasioned by the resignation of Dr. R. P. White, assistant professor of botany and assistant plant pathologist, as previously noted, has been filled by the appointment of Dr. O. H. Elmer, assistant plant pathologist in the Iowa Station, who entered upon his new duties May 21.

Massachusetts College.—Dr. Robert J. McFall, extension professor of agricultural economics and on leave of absence for work in cooperation with the U. S. Department of Commerce, has resigned effective June 1 to become special agent in the Bureau of Foreign and Domestic Commerce of that department.

Mississippi Station.—The Delta Substation at Stoneville, located on the highest land of the region, was submerged in the recent floods to a depth of from 1.5 to 6.5 ft., but was fortunate in escaping serious damage. The property loss in livestock, buildings, and growing crops for the State as a whole is estimated as in excess of $250,000,000. It is regarded as doubtful whether more than 30 to 40 per cent of the flooded area can be replanted this season.

A laboratory and office are being fitted up at the main station to accommodate the station home economics department, hitherto located on the campus of the Mississippi State College for Women at Columbus.

Montana College and Station.—H. K. Wilson has been appointed assistant in agronomy in the college and station, succeeding H. N. Watenpaugh, resigned.

Nevada Station.—C. A. Brennen has been appointed range economist, beginning June 1, and will have charge of the Purnell project entitled A Study of the Economics of Cattle Production on Ranch and Range in Nevada.

Clemson College.—Lyman Neel has been appointed extension specialist in poultry husbandry.

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NOTE.—The abbreviations "Ala.," "Conn. State," "Mass.," etc., after entries refer to the publications of the respective State experiment stations; "Alaska," "Guam," "Hawaii," "P.R.," and "V.I." to those of the experiment stations in Alaska, Guam, Hawaii, Porto Rico, and Virgin Islands; "Can." to those of the experiment stations in Canada; and "U.S.D.A." to those of this Department.

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